Comparison of Teachers' and Expert Judgment's Perceptions of the Integrated Thematic Instruction (ITI/HET) Affordances of Highlands Elementary School Grounds

A THESIS
SUBMITTED TO THE FACULTY OF THE UNIVERSITY OF MINNESOTA
BY

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IN PARTIAL FULLFILLMENT OF THE REQUIREMENTS
FOR THE DEGREE OF MASTER OF SCIENCE

David G. Pitt, Advisor

November, 2014

ACKNOWLEDGMENTS

Thank you to those who helped me through this process. To my advisor and committee chair David Pitt, for his deep insights, and guidance, and help. To John Comazzi; this study would not have happened without his connections and introductions to Highlands Elementary School, and for his guidance along the way. And to Lance Neckar, who has encouraged me, and has helped balance the process in this journey.

Thank you to Highlands Elementary School in Edina Minnesota, especially to teacher Katie Oberle, to Principal Peter Hodne, and to the many Highlands teachers (including Erica Wattson) who helped shape this study and who also participated in the teachers' survey.

Finally, thank you to my family, who endured the many years of my toiling through this process. And a special thanks to my father, whose passion for design for the common good as an architect fueled my passion for planning and design for the common good as a landscape architect.

ABSTRACT

Highlands Elementary school grounds were originally constructed for play, and since 2011 some settings have been (re)designed with teaching in-mind. Use of school ground settings for teaching based on the Highlands Integrated Thematic Instruction (ITI) approach varied; some teachers were unaware of teaching opportunities that the settings "afforded." The author hypothesized that by comparing teachers' affordance perceptions with the author's "expert judgment" perceptions, opportunities could be identified to improve the "fit" of teachers' and expert judgments' perceptions in ways that would enhance suitability for teaching using the ITI approach as practiced at Highlands.

Three settings, the Literary Park, East Lawn, and Raingarden, were rated by teachers and expert judgment regarding the suitability of the setting for instruction in ITI curriculum components of Science, Health, Social Studies, Student Inquiry, and teaching using Students' Senses/Sensory Richness affordances. Data was interpreted at and across settings regarding teaching affordances. Relatively similar patterns were found in Science, Student Inquiry, and teaching using Students' Senses curriculum and lesson activity component affordance perceptions of teachers and expert judgment. Health and Social Studies affordances were perceived differently. Differences helped develop opportunities to alter teaching activities, to intervene in setting design to enhance suitability for teaching using the ITI approach, and in suggestions for teachers' professional development.

Potential opportunities to alter teaching activities and intervene in setting design to enhance suitability for teaching vary by setting, as do professional development suggestions. At Literary Park, Science, Social Studies, Student Inquiry, and Sensory affordances opportunities were identified, including ways to increase setting diversity that takes advantage of the setting's seating. At East Lawn, opportunities focus on edge elements, especially opportunities to enhance the setting's near-building edge for all components, especially for younger students. At Raingarden, opportunities include ways to enhance curriculum and lesson activities given it being a man-made setting with environmental, social, and educational purposes, and connecting its attributes and opportunities to those of the pond below it.

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OTHER ITEMS

Terms

Curriculum: means district or school adopted programs and written plans for providing students with learning experiences that lead to expected knowledge and skills (2012 MN Statute 120B.11, Subd. 1b).

Expert Judgment: means the author, and the author's ratings of ITI curriculum and lesson affordances based on his professional, or expert, judgment.

Instruction: means methods of providing learning experiences that enable a student to meet state and district academic standards and graduation requirements (2012 MN Statute 120B.11, Subd. 1a).

Place (or Activity Place): see "Setting."

Play: Play is a free and meaningful activity, carried out for its own sake, spatially and temporally segregated from the requirements of practical life, and bound by a self-contained set of rules that hold absolutely. Huizinga, J. (1955). Homo ludens; a study of the play-element in culture. Boston, Beacon Press.

Sense: a faculty by which the conditions or properties of things are perceived. Five major senses were traditionally considered: vision, hearing, smell, taste, and touch. In addition, equilibrium, hunger, thirst, malaise, pain, and other types of senses have been distinguished. The operation of all senses involves the reception of stimuli by sense organs, each of which is sensitive to a particular kind of stimulus. The eyes are sensitive to light; the ears, to sound; the olfactory organs, to odor; and the taste buds, to taste. Various sense organs of the skin and other tissues are sensitive to touch, pain, temperature, and other sensations. On receiving stimuli, the sense organ translates them into nerve impulses that are transmitted along the sensory nerves to the brain. In the cerebral cortex, the impulses are interpreted, or perceived, as sensations. The brain associates them with other information, acts upon them, and stores them as memory. See also nervous

system and brain (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Ed. 2003 Saunders; Elsevier, Inc.).

Setting: *(Behavior) Settings* are bounded subspaces and the predictable behavior patterns they afford, for example "entry," (Moore, 2007) and are ways of thinking about, categorizing, structuring and designing places and teaching-curriculum opportunities and connections. Behavior settings can be further refined as *"Activity Places,"* identified behaviorally and physically as discrete places by the way used, named, or visually represented. An Activity Place contains an assortment of fine-grained elements that contribute to functional diversity for example trees, benches, and is designed to combine or naturally acquire a mix of different types of elements; Biotic, Abiotic, Found, and Constructed. Activity Place design process deals with choice and assembly of Fixed features, Loose Parts, Natural Phenomena, and Populations of People and Other Organisms. Activity Place design, in the educational context, is managed to meet learning objectives and child development goals (Moore and Wong, 1997).

Themes: Organization of each grade's curriculum by concepts using a year- long "theme," which connects curriculum to academic standards. Each thematic component incorporates lesson themes and activities derived from Minnesota Academic Standards and other relevant Academic Standards and Benchmarks; used to integrate Science Health, Social Studies curriculum, which is integrated conceptually with other subjects (Pates, 2011).

Abbreviations

Highlands: Highlands Elementary School

HES: Highlands Elementary School

HET: Highly Effective Teaching Model (see ITI/HET)

ITI: Integrated Thematic Instruction aka ITI/HET

ITI/HET: Integrated Thematic Instruction/Highly Effective Teaching Model; the model developed by Susan Kovalik and practiced at Highlands Elementary School

CHAPTER 1: INTRODUCTION

STATEMENT OF THE PROBLEM

The "outdoor play and learning" settings on the school grounds at Highlands Elementary School (Highlands) in Edina, MN were originally planned, designed, and constructed for "play," not for teaching and learning. When these settings (kindergarten play area [2008-2009], dry stream bed play area and mounds and moguls [2009]) were initially designed, there were no specific teaching goals relating to outdoor learning as it was not a specific emphasis within Highlands practices and curriculum. Design goals focused on unstructured play. Making long-term school ground maintenance easier was also a design goal (Luger and Halvorsen, 2009). The development of play areas after 2009 included a focus on learning in the setting in addition to play. These settings include a raingarden, sensory and butterfly gardens, and a produce garden (2010-2011). Planning and design of the school grounds now created a "multi-layered approach" to the site, geared towards play of students of different ages, abilities, and stages of human development.

Use of the school grounds settings in delivering the Highlands Integrated Thematic Instruction approach and curriculum varied among teachers. An autumn 2009 survey of Highlands' teachers revealed some of the reasons why the schoolyard was purposely not used for outdoor teaching. Some teachers "had not found a use" for the play areas or did not think about using them for learning until the end of the day or week. Others were afraid of stepping on someone's toes or of using the site in an "incorrect" manner. Several Highlands teachers felt uncomfortable when teaching outdoors. They wanted and needed time to integrate the outdoors into lesson plans, and less pressure to use the site.

The school ground settings used most for outdoor teaching and learning included the kindergarten area, northwest woods, riverbed area, and Husky Woods. Other areas used less often included the pond behind school, the Literary Park, and an unspecified area for "Journey North Project" with kindergartners. Settings were used for play and curriculum/content learning related to free play/exploring (with kinder buddies); math (riverbed rocks for complements of 10, or simple 5 minute tasks such as estimating the number of branches on a tree); themes (in Husky Woods, and pond); writing activities (for example the NW Woods for nature notebook), poetry writing, reading aloud, language arts, and nature observation (see Figure 1-1).

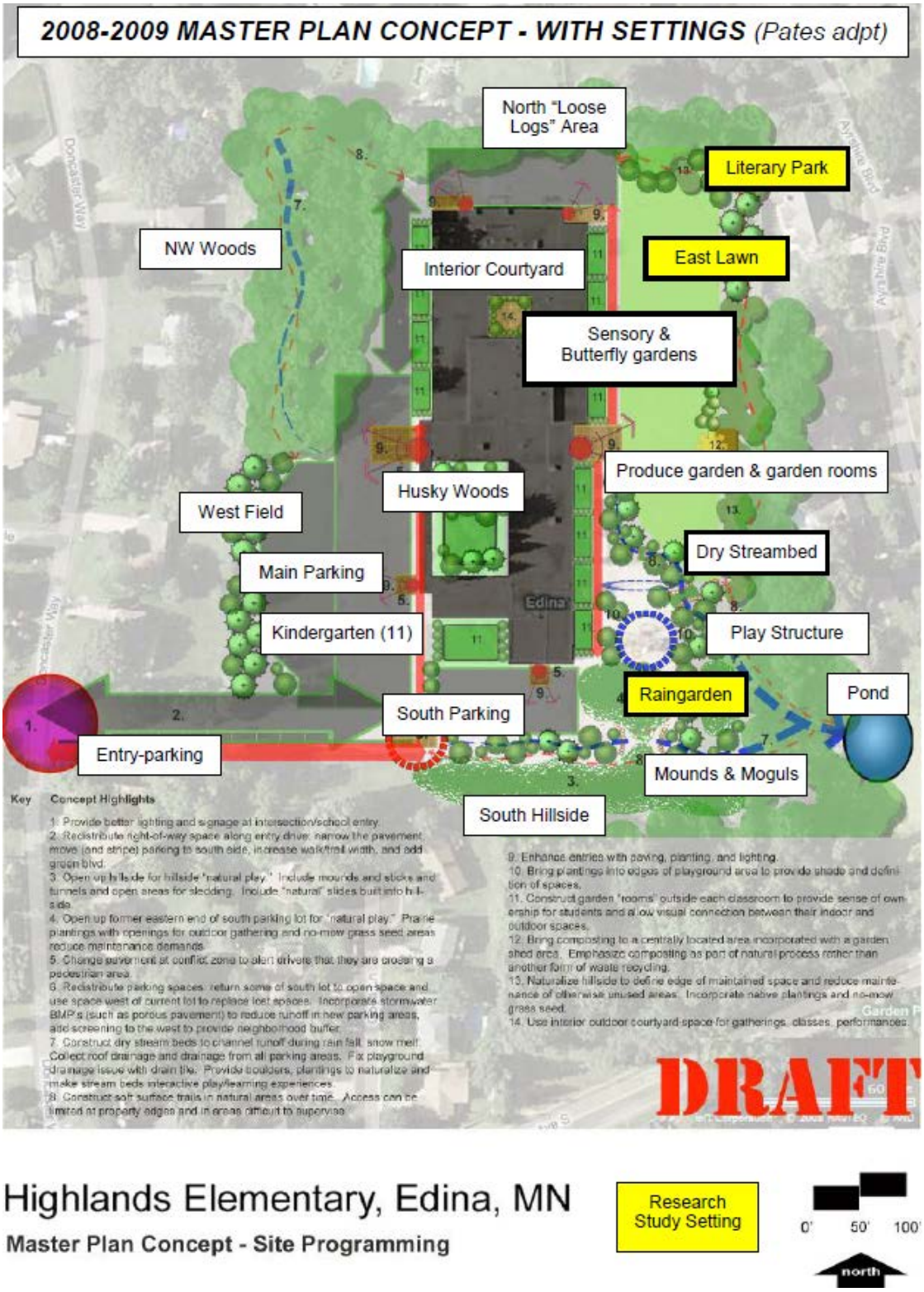

Figure 1-1. Highlands Elementary Master Plan Concept, with School Settings

The survey results, post-survey debriefing and follow-up, and discussions with teachers suggest that some teachers had difficulty understanding how the various play area settings could be used in delivering Highlands curriculum to students of various ages. They were unfamiliar with ways in which a setting's *attributes* may be used to realize its potential in educating Highlands' students. The teachers were unaware, or less aware, of the learning affordance opportunities that the play area settings and their attributes offer for supporting the implementation of Highlands ITI approach in the school grounds outdoor settings.

THEORETICAL CONTEXT OF THE PROBLEM

Integrated Thematic Instruction (ITI) and the Highly Effective Teaching Model

First called Integrated Thematic Instruction or ITI (and now known as the Highly Effective Teaching model), ITI structures and implements the curriculum at Highlands, and it is instrumental in developing and delivering integrated thematically-structured curriculum at Highland Elementary School (Highlands). Originally developed in the 1980's by Susan Kovalik, the model is a brain-compatible model grounded in the biology of learning, effective instructional strategies, and the development of conceptual curriculum. ITI is based on five principles of learning:

- Intelligence is a function of experience. Students acquire knowledge best when learning in context of a coherent whole that relates their learning to the "real world."
- Learning is an inseparable partnership between brain and body. Emotion is the gatekeeper to learning and performance, and movement enhances learning.
- People possess multiple intelligences, which help enable alternative ways of solving problems and/or producing products.
- Learning is a two-step process: a) making meaning through pattern-seeking, and b) developing a mental program for using what we understand and wiring it into long-term memory. In the words of Highlands Principal Peter Hodne, this is "[w]hat we are trying to program [pattern-seeking and mental program development] in the students' minds" (Pates 2011, p. 1).
- Personality impacts learning and performance.

ITI helps conceptualize and orchestrate Bodybrain-Compatible learning environments by implementing the science of learning (how the brain learns) and its implications within the classroom for school-wide improvement (Kovalich, 2011). The nine Bodybrain-Compatible Elements of ITI are primary ways of translating neuroscience research into action in teaching and learning, and include:

- Absence of Threat/Nurturing Reflective Thinking (a safe, meaningful environment)
- Meaningful Content (determined by the learner)
- Enriched Environment (immersive, real places)
- Movement to Enhance Learning (activates and focuses bodybrain systems)
- Choices (options to demonstrate understanding through multiple intelligences, higher level thinking, and personality preferences)
- Adequate Time (to explore and understand, and use ideas, information, and skills)
- Collaboration (working together toward a common goal)
- Immediate Feedback (and ongoing)
- Mastery (Application; what is learned and what can be done with it; ensures that students acquire mental programs to use in real-life situations and store in long-term memory).

Behavior Settings, and the Integrated Thematic Instruction (ITI)

Outdoor Play and Learning Area Behavioral Settings. School ground behavior setting theory and practice (Moore and Wong 1997, and Broda 2007) is instrumental in structuring the framework, hypothesis, and methods of this research. A varied, flexible school site with an assorted mix of site elements creates the largest set of integrated and thematic teaching and learning opportunities (Broda, 2007). More diverse environments provide a broader range of curricular options. Increased diversity provides increased play (and learning) options (Moore, 1997). School ground settings support activities and the places in which activities happen. They are behaviorally and physically discrete places identified typically by how they are used, named, or visually perceived and graphically represented. Each setting has assorted elements that contribute to functional diversity. The elements afford, or support, play and learning functions and activities.

INSTITUTIONAL CONTEXT OF THE PROBLEM

Introduction, and State and Federal Education Curriculum Guidelines and Standards

Each grade's curriculum at Highlands uses a yearly "theme-based" approach to the integrated teaching of multiple subjects, and organizes subject matter by concepts within the themes, based on Minnesota Academic Standards, federal, and other Academic Standards.

Lesson activities also integrate the multiple subject areas. The themes evolved from Edina Public Schools Elementary Curricular/Content Areas. Edina Public Schools, and the Highlands elementary school curriculum are aligned with Minnesota State Education Standards and related federal education standards; these are also used to prepare Highlands students for the taking the Minnesota state education assessment tests.

State and national/federal Education Standards and guidelines organize curriculum by grade using subject "strands" and substrands, "standards" and "benchmarks," with recognition that a progression of learning experiences in earlier grades builds on the foundation for mastery later on. Mastery of subject content is expected at each grade level. Subject content is organized by "strands" (for example, in Science "The Nature and Science of Engineering" strand). Each strand has "substrands" that contain two or more academic "standards" and at least one "benchmark." The benchmarks supplement the standards by specifying the academic knowledge and skills that schools must offer and students must achieve to satisfactorily complete a standard. Education standards are "statements" of content, and benchmarks are "learning outcomes." Many benchmarks include examples that clarify the meaning, or indicate the level of student understanding (see Figure 1-2).

	Strand	Substrand	Standard Understand that...	Code	Benchmark
1	4. Life Science	1. Structure and Function in Living Systems	1. Living things are diverse with many different observable characteristics.	1.4.1.1.1	Describe and sort animals into groups in many ways, according to their physical characteristics and behaviors.
		2. Interdepen-dence in Living Systems	1. Natural systems have many components that interact to maintain the living system.	1.4.2.1.1	Recognize that animals need space, water, food, shelter and air.
				1.4.2.1.2	Describe ways in which an animal's habitat provides for its basic needs. *For example:* Compare students' houses with animal habitats.

Figure 1-2. Portion of Draft Minnesota Academic Standards in Science, 4/27/09.

Minnesota and National Education Standards and Benchmarks used in developing and implementing Edina Public Schools elementary school curricular content were also used in developing and carrying out this research, and included Minnesota Academic Standards; Science K-12 2009 Version, put into rule effective 5/24/10; National Health Education Standards and Minnesota Benchmarks; 2007 National Health Education Standards, from the MN Department of Education Health and Physical Education Quality Teaching Network 2007 Draft; and Minnesota Draft K-12 Academic Standards in Social Studies, April 29, 2011 draft. When final, these standards were to be implemented no later than the 2013-2014 school year.

Edina School District and Highlands Elementary Education Practices, Curriculum Guidelines, Standards

Curriculum Components, Guidelines and Standards. Edina Public School District Elementary curricular content areas include Art, Integrated Language Arts, Math, Music, Physical Education, Science/Health, and Social Studies. The Edina School District also has District-specific Education Standards and Benchmarks, including Health Curriculum; these were also used in developing and carrying out this research.

Highlands uses the Curricular Content Areas of Art, Integrated Language Arts, Math, Music, Physical Education, Science/Health, and Social Studies to organize each grade's curriculum subject matter by concepts within a year-long "theme." Thematic "points" within the curriculum answer teachers' questions relative to "what do I want my students to understand?"

They offer guidance on what to teach in terms of essential knowledge, concepts, and skills that students should learn, understand, and be able to apply.

Cara Rieckenberg, former Environmental Education Coordinator at Prior Lake-Savage Area Schools/ISD 719, examined and marked-up the Minnesota Academic Standards; Science K-12 2009 Version, regarding the MN Science Standards curriculum "strands" that best fit with outdoor teaching and learning. She indicated the strands she "recommended" be taught outside (moderate curriculum and lesson activity "fit" highlighted in yellow) and those she thought "should" be taught outside (best fit, highlighted in green)(also see Figure 1-2). Highlands used this marked-up document to better understand how to take advantage of its school grounds for outdoor teaching and learning of science. The Author also used this in developing and carrying out this research.

Lesson activities integrate the multiple subject areas in exploration of themes, and are used to apply, reinforce, and extend curriculum key points derived from education standards.

Modes of Learning. Highlands offers the options of the Continuous Progress (CP) or Discovery Program class structure for its students. CP consists of multi-age, multi-grade classes; two classrooms form a "family" (i.e. two classes of grades 1-3 and 3-5). Students stay in a "family" for 5 elementary years with the same two core teachers. Learning is direct experience based and aims to foster self-directed lifelong learning. The Discovery Program consists of single grade-level classes; students stay together for the 5 years and "Loop" with the same teacher and students for 2 years (i.e. 1^{st}-2^{nd} and 3^{rd}-4^{th}). Classes in both programs also go to "environmental camps."

Outdoor Learning Linked with Play Activities. In implementing ITI, Highlands integrates outdoor learning with play activities related to learning objectives based on a particular stage of human development. Highlands employs several curriculum and lesson activities mechanisms, and teaching/instruction styles and modes, in delivering Highlands' integrated curriculum. They include:

- Play Activities focused on psycho-motor, dexterity, social, perceptive, affective, and cognitive characteristics of student development
- Learning Lessons and Activities used to apply, reinforce, and extend curriculum key points derived from Minnesota Academic Standards
- Inquiries (by students, used to apply, reinforce, and extend curriculum key points

- Sensory Rich "Being There" Experiences to help build emotion and emotional connections. These experiences are considered to be a "gatekeeper" to learning and performance
- Cooperative Learning, in which students are paired, grouped, or teamed in most activities. Students process and report learning as individuals or in groups; this connecting of students also helps create richer Sensory Rich "Being There" Experiences. Cooperative tasks are used regardless of the instruction style.
- Instruction Styles; typically a mix of *Direct* (formal "teaching" *to* students), *Semi-direct* (informal, student interaction with environment is a prime motivating force; teacher *facilitates* curriculum connections), and *facilitated/non-formal* (a *wide range* of activities and modes)
- Instruction Modes; including research, inquiry, modeling, discovery.

Gardener's Multiple Intelligences. Gardner identified a minimum of eight modes of intelligence for solving problems or producing products. He postulates that the human brain possesses all eight forms; however, many are not developed or are underdeveloped in individuals due to lack of experiences. The "Intelligences" are Linguistic (word smart), Logical (mathematical-number/reasoning), Spatial (picture and space/relationships), Bodily/Kinesthetic (movement), Musical, Interpersonal (people), Intrapersonal (self), and Naturalistic (nature smart regarding plants, animals, environmental aspects) (Gardiner, 2004/2012).

Gardner's Theory of Multiple Intelligences is a major component of the Integrated Thematic Instruction as developed by Kovalich (Kovalich, 2011). Integration of curricular themes and theme components at Highlands incorporates Gardner's theory through use of inquiries, which are based on teacher-facilitated activities that employ diverse components of the theory (Pates, 2011).

Gardner states that "fundamentally, an Intelligence refers to a bio-psychological potential of our species to process certain kind of information in certain kinds of ways (Gardiner, 2004/2012, p. 1). This entails the bio-psychological potential to process information that can be activated in a cultural setting to solve problems or create products of value in a culture. As "cognitive pathways" that students possess, "multiple intelligences" influence what and the ways that material is presented at Highlands (for example, use of science notebooks, attending

environmental camps, etc). Through pattern-seeking and mental program development activities, multiple intelligences create more memorable and integrated learning (Pates, 2011).

***Sensory-rich, Being-there Experiences*.** Another major focus of Highlands' ITI approach is integrated learning and play activities in settings that afford sensory-rich "being-there" experiences. The development and use of curricular themes, and teaching and learning activities, is coordinated with the sensory-rich properties (or faculties) of the school grounds' settings.

The sensory rich faculties and natural phenomena affordances of elements in each school ground setting afford, and are used, in developing and teaching the science, health, and social studies curriculum components of the school's ITI approach. This approach integrates significant curricular strands, sub-strands and benchmarks into the curricular themes. Sensory faculties and natural phenomena affordances are also tapped into in teaching, and in student inquiry, based on the eight intelligences of Gardiner's Multiple Intelligences theory.

The common sensory faculties of hearing, taste, touch, smell, visual/seeing, thermal/temperature, humidity, time/space, and vestibular (gravity and position) are significant sensory faculties. The natural phenomena affordances of a setting element, and its sensory faculties, are considered in combination with the faculty itself (for example, a visual faculty and the ability to sense sun/shade/shadow phenomena affordances) in developing and use of curricular themes, and teaching and learning activities.

AUTHOR: DESIGNER'S "EXPERT JUDGMENT"

The author (a Landscape Architect) is using his professional "expert judgment" in evaluating the perceived "actual" ITI curriculum and lesson activity learning affordances offered by the Literary Park, East Lawn, and Raingarden. The author is comparing the teachers,' and the expert judgment's, ratings of ITI curriculum and lesson activity affordances at each setting, and across settings. This evaluative comparison is a major component in evaluating and identifying opportunities for ITI curriculum and lesson activities at each setting, across settings, in setting design, and for teacher training and professional development.

Expert Judgment Basis for Comparing Teacher, and Expert Judgment, Ratings of the School Grounds Affordances

Prior to development and acceptance of a formal research proposal, the author understood that he had limited exposure, understanding, and awareness of the ITI approach to teaching and learning at Highlands. In order to develop a better understanding of Highlands ITI approach to teaching and learning, and the potential ITI affordances of Highlands school grounds, the author, over about a two-year period, 1) met with University of MN Architecture professor John Comazzi to learn about his activities at Highlands, including "Design Camp" 2) met with the designers (Karen Luger, Brady Halvorson) of some of the newer outdoor play and learning areas (for example, the outdoor kindergarten, dry streambed), 3) met multiple times with Teacher Katie Oberle regarding the history, intent, and use of the school grounds by students and teachers, 4) met with teachers and Highlands Principal Peter Hodne regarding the ITI approach and the school grounds, 5) participated in multiple outdoor education professional development sessions with Highlands teachers, 6) gave feedback on a survey regarding teachers' use of the school grounds, 7) participated with teachers and students in an Edina Day of Service, helping to build a mound with circular sitting feature next to the dry streambed, 8) participated in a day of "Design Camp" at Highlands, and 9) conducted an initial and subsequent detailed literature reviews which further informed and refined the theoretical and institutional contexts of the problem, as well as the research questions and methods.

The above activities were instrumental in initiating and developing the research concept, hypothesis, and approach, of comparing the teachers' and expert judgment's perceptions of the school yard settings affordances. Of particular importance in this regard were detailed discussions informed by the activities and information (including the literature reviews) above with Highlands elementary school teachers and Principal Peter Hodne, and the author's Master's advisor and committee.

A research approach that used as directly as possible a "same-setting-elements comparison" was deemed important, and was developed, in comparing and evaluating teachers and expert judgment ratings of ITI affordances at and across the three school grounds settings selected and researched. A consistent use of the institutional, and theoretical contexts of the problem (as discussed earlier), were deemed important, and used, in developing the hypothesis

and conducting the research, including in comparing and evaluating teachers and expert judgment ratings, and in the resulting analysis, evaluations, findings, discussion, and conclusions.

RESEARCH PURPOSE, OBJECTIVES, AND RESEARCH QUESTIONS

The "outdoor play and learning" settings on Highlands's school grounds were originally planned, designed, and constructed for "play," not for teaching and learning. Results from a previous survey, and discussions with teachers suggested that some teachers were having difficulty understanding how the various play area settings could be used in Highlands ITI approach to curriculum and lesson activities for students of various ages. Some teachers were unfamiliar with ways in which a setting's *attributes* could be used to realize its potential in educating Highlands' students. They were unaware of the "learning affordance" opportunities that the settings, and their attributes, offered for teaching and learning outside at Highlands' based on its ITI approach.

Research Hypothesis

The author hypothesizes that by identifying and interpreting Highlands Teachers' perceptions of the school grounds ITI affordances, and comparing the individual Teachers' perceptions with the author's "expert judgment" perceptions of "actual affordances," opportunities for ITI curriculum and lesson activities at each setting, and across settings, in setting design, and for Teacher training/professional development can be identified.

Research Objectives

The research has the following objectives:

1. Identify and interpret the perceptions of Highlands's teachers relative to the affordances offered by three outdoor play and learning settings in the Highlands School yard used in delivering Highland's ITI approach and curriculum. The settings are the Literary Park, East Lawn, and Raingarden.
    - identify and interpret teachers' perceptions of science, health, and social studies curriculum and lesson activity affordances of the school ground's research settings;

- identify and interpret teachers' perceptions of the student inquiry (activity rooted in Gardner's theory of "multiple intelligences") affordances of the school ground's research settings; and
- identify and interpret teachers' perceptions of the sensory richness of the research settings in affording Highlands student's sensory-rich "being there" experiences.

2. Use the authors' professional "expert judgment" in evaluating the "actual" ITI learning affordances offered by the research settings
3. Compare teachers' and expert judgment's ratings of affordances for curriculum and lesson activities at each setting, across settings, and relative to setting design
4. Identify opportunities for ITI curriculum and lesson activities at each setting, across settings, for setting design, and for teacher training/professional development.
5. Develop an affordances summary to help Highlands teachers better understand the ITI teaching and learning opportunities afforded by the existing school ground's research settings. The summary would contain findings, discussion, and observations regarding appropriate opportunities for science, health, and social studies curriculum and lesson activities, potential changes in setting design, and for possible teacher training/professional development activities.

Research Questions

The following research questions guided the operationalizing (methods, findings, interpretation, and discussion) of this research in order to achieve the research purposes:

1. How does expert judgment interpretation of affordance presence and suitability relate to statewide/district curriculum standards and lesson activities? Technically speaking, how do curriculum and lesson activity affordances of the Literary Park, East Lawn, and Raingarden relate to those standards and activities?
2. How do teachers think that site elements at each setting compare in their perceived suitability, or affordances, for teaching Science, Health, Social Studies, in Student Inquiry, and Sensory Rich lesson activities?
    - Which setting elements are suitable, or afford, teaching of curriculum and lesson activities?
    - How suitable are they?

3. Across the three settings, how do teachers and the expert judgment perceive the affordances of these settings for teaching science, health, social studies, in student inquiry, and sensory rich lesson activities?
4. Do teachers' and the authors' expert judgment ratings of affordance presence and suitability vary across settings? How are teachers' and expert judgment ratings different across settings, and what kinds of patterns exist in their ratings across Settings?
5. If there are differences in the teachers' and the expert judgment's ratings of affordance presence and suitability, why are there differences in these perceptions?
6. What opportunities can be identified for curriculum and lesson activities at and across each setting for setting design, and for teacher training/professional development to improve the fit of Teachers' perceptions of affordances with the affordances as perceived by expert judgment?

CHAPTER 2: LITERATURE REVIEW

This chapter examines Affordance Theory as it has been adapted to facilitate the design of the settings for outdoor play and learning in the school yard of elementary schools. The chapter also explains the underlying conceptual framework for Highland Elementary School's curriculums and examines instructional practices used in implementing the framework.

AFFORDANCE THEORY

Moore, in 2007 (p. 23), defined an affordance as "the property of a behavior setting or feature as perceived by an individual as a means of supporting a specific activity." Gibson's (1979) guiding concept of affordance states that "[t]he affordances of the environment are its functionally significant properties considered in relation to an individual." This accounts for the fact that our perceptual experiences include not only awareness of the structure of objects and events in the environment, but also an awareness of their functional significance and meaning. In the context of the ITI curriculum model at Highlands School, objects and events in the school grounds offer opportunities to pursue integrated themes within defined play and learning areas, also known as behavior settings, or simply "settings."

Perception plays a significant role in attaining awareness or understanding of school ground learning affordances by organizing and interpreting sensory information. Identifying these learning affordances is shaped by learning, memory, and expectation of the individuals (both teachers and students) using the space, both in the mode of delivering curriculum by teachers or in the students learning mode.

EDUCATIONAL AFFORDANCE THEORY

Relationship of Affordances to Play Area and School Ground Design

School grounds have a significant impact on children's development. Broad involvement of teachers, curriculum developers, and educational administrators with designers is most needed in the process of defining and creating learning affordances to facilitate delivery of formal, informal, and "hidden [or unspoken] curriculum" (Stine and Lucus, 1995).

As perceived by Highlands' teachers, some school ground settings may be useful for a wide range of ITI curriculum and lesson activities; others may be limited in such affordances. Research into the perceived affordances of the settings for ITI can help understand the perceived strengths and weaknesses of the learning settings, and identify what information may help teachers understand the ITI affordances of the researched settings.

Play Areas as Behavioral Settings

School ground behavior setting theory and practice (Moore and Wong, 1997, Broda, 2007) is instrumental in structuring the research framework, hypothesis, and methods of this thesis. A varied, flexible school site with an assorted mix of site elements creates the largest set of integrated and thematic teaching and learning opportunities (Broda, 2007). The more diverse the environment, the broader the range of curricular options available. Increased diversity provides increased play (and learning) options (Moore, 1997). School ground settings support activities in places in which activities happen. Settings are behaviorally and physically discrete *places* identified by how they are used, named, or visually perceived and graphically represented. Each setting has assorted elements that contribute to functional diversity, and "afford" (support) play and learning functions and activities.

For the most part, settings should be different in size and physical character (Moore, 1987). Different age groups use different spaces in different ways, and children achieve different developmental goals at different stages of development, and at different rates. Settings should vary in space, size, location, and be interconnected to give choice of play (*and learning opportunities*). Well defined activity areas facilitate children's participation in all types of activities.

Structure of Settings and Importance of Diversity of School Ground Setting Characteristics

More diverse elements within settings leads to opportunities for creating a larger array of ITI affordances for students of all ages and abilities. Greater diversity better affords different teaching modes and learning styles, and enhances student's sense of connectedness to their learning environments. Manipulable elements, exposure to and understanding of cycles (for

example, seasonal), and human interactions as individuals and in cooperative learning groups is enhanced by setting diversity (Moore and Wong, 1997).

Diversity better enables a full range of learning throughout the learning cycle (the cycle of learning based on age and/or stage of human development); it offers opportunities to observe, explore, discover, record, express, apply, and transfer significant concepts, knowledge, and skills among both younger and older students. A diversity of setting elements enables the exposure and experience of natural phenomena and sensory rich "being-there" experiences on multiple levels of complexity (Moore and Wong, 1997).

Significant elements of setting diversity include water, plentiful (preferably indigenous) vegetation, animals, sand (best if mixed with water), diversity of color and textures in materials, ways to experience changing seasons (wind, precipitation), natural places to sit in and under, levels of nooks and crannies providing opportunities for socialization and privacy and views, structures and equipment and materials that can be changed, and an abundance of loose parts or elements that can be manipulated by students for multiple purposes(White, 2004).

Moore and Wong developed the concept of the "Curriculum Switchboard" (see Figure 2-1) to help teachers expand their range of learning and lesson activity options. Structured using five critical instructional concepts: the Learning Cycle, Ecological Concepts, Interdisciplinary Learning, Teaching-Learning Modes, and Developmental Skills, the Switchboard differentiates design, teaching, and learning based on the children, teachers, and settings, and can be used to assess settings (for example, their strengths, weaknesses), opportunities for "interdisciplinary" teaching and learning (based on curriculum content, pedagogic goals) and children's developmental needs.

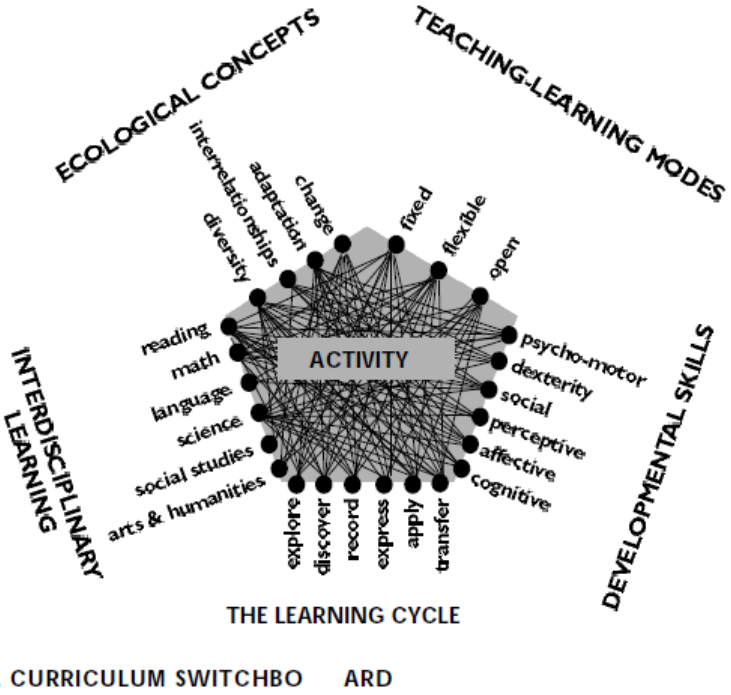

Figure 2-1. Curriculum Switchboard (Moore and Wong 1997).

The Curriculum Switchboard encompasses all five senses, all subject areas, all environments as a central feature of an educational mission. It facilitates learning through the environment as well as learning about the environment (Moore and Wong, 1997). In a sense, the Curriculum Switchboard is Moore and Wong's way of helping understand, connect, and illustrate conceptually the relationships and opportunities of curriculum and site in an integrated thematic instruction framework.

Structure of Settings as Places for Teaching and Lesson Activities

Settings can be identified behaviorally and physically as discrete places by the way they are used, named, or visually represented. The planning and design of school ground settings involves the

choice and assembly of the settings elements, typically fixed features, loose parts, natural phenomena, and populations, of people and other organisms. Each Place (see Figure 2-2) is designed to combine (or naturally acquire) a mix of biotic, abiotic, found, or constructed (built) settings' elements (Moore and Wong, 1997). This is an ongoing, dynamic, iterative process, and in the educational context must be managed to meet a program of learning objectives and child development goals (Moore and Wong, 1997).

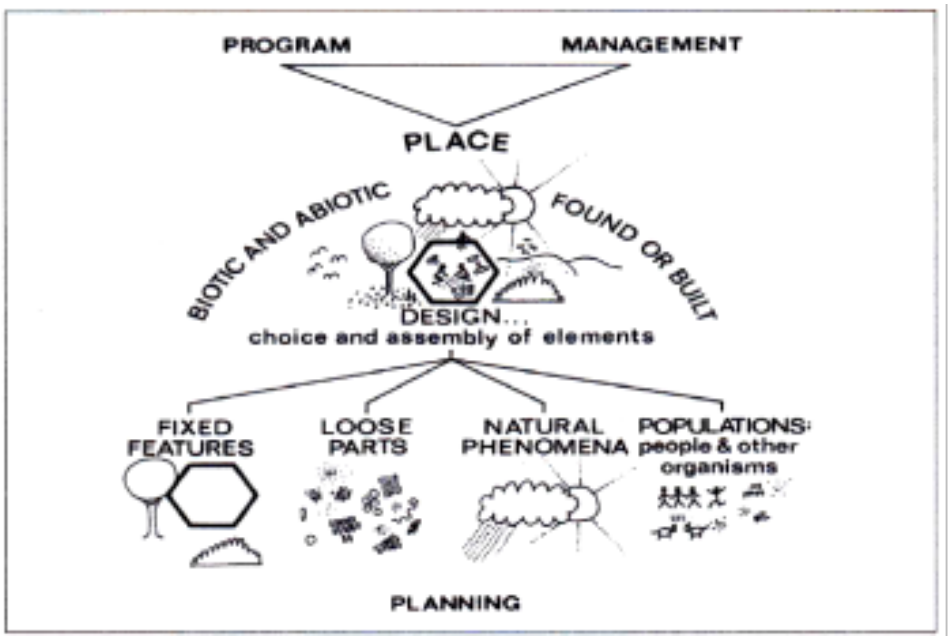

Figure 2-2. Elements of Place (Moore and Wong 1997).

BASIS AND PRACTICE OF ITI AT HIGHLANDS ELEMENTARY (HES)

Significant Components of the ITI/HET Model and Basis' of ITI/HET Approach at Highlands

As listed below, there are a number of significant concepts and practices that form the basis of the ITI approach at Highlands (Pates, 2011). The following list of significant concepts and practices have already been addressed earlier in Chapters 1 and 2. Narrative material following this list identifies additional concepts and practices of the ITI approach. Previously identified concepts include:

- Outdoor learning is integrated with play activities.
- Play activities are focused on the psycho-motor, dexterity, social, perceptive, affective, and cognitive characteristics of the student's development.
- Learning objectives, year-long themes, and curricular key points are based on stages of human development, and are informed by federal and Minnesota Academic Standards, and from the Edina Public Schools Elementary Curricular Areas/Content of Art, Integrated Language Arts, Math, Music, Physical Education, Science/Health, and Social Studies.
- Curriculum and learning lessons and activities use a year-long theme to integrate the teaching of multiple subjects, and are used to apply, reinforce, and extend curriculum key points derived from Minnesota Academic Standards.
- Curricular key points focus on "what" to teach; essential knowledge, concepts, and skills that students are expected to apply.
- Inquiries (by students) are used to apply, reinforce, and extend curriculum key points. Much of the integration of curricular themes and theme components incorporates Howard Gardner's "Theory of Multiple Intelligences" through use of inquiries.
- Learning lessons and activities are framed in the understanding that students acquire knowledge best when learning in context of a coherent "whole," and relate their learning to the "real world." Settings that also afford sensory-rich "being-there" experiences help build emotion and emotional connections, which are "gatekeepers" to learning and performance.
- The use of Cooperative Learning, in which students are paired, grouped, or teamed helps connect students and is a richer learning experience. Cooperative tasks are used regardless of the Instruction Style.
- Use of a continuous set or class of students and teachers across multiple ages and grades, in either the Continuous Progress Program, or Discovery Program.
- Use of a mix of Instruction "Styles" for delivering the integrated curriculum and lesson activities ranging from Direct (formal teaching to the students) Instruction, to Semi-direct (informal facilitated teaching) to [mixed] Facilitated (non-formal teaching using a wide range of instruction modes) Instruction leads to enhanced retention of material by students.
- Using a mix of Instruction "Modes," such as research, inquiry, modeling, discovery enhances student retention of student material.

Additional Components of the ITI/HET Approach at Highlands

Play Activities. Learning outdoors at Highlands is integrated with and through play activities. Play activities focus on psycho-motor, dexterity, social, perceptive, affective, and cognitive characteristics of the student's development. "Free Play" or unstructured play, is the main style of play at Highlands. Semi-structured and structured plays are also used. Play may be solitary (playing alone), parallel (playing near or next to each other but not together), or cooperative (playing together) in nature (Pates, 2011). Cooperative play is also an aspect of cooperative learning at Highlands; it helps connects students and entails a richer learning experience.

Curricular Key Points. Curricular key points focus on "what" to teach, and it identifies the essential knowledge, concepts, and skills that students are expected to apply. Key points should answer the [teachers'] question "what do I want my students to understand?" Key points are succinct statements of learning goals and what students are expected to learn, and are typically stated in a manner that facilitates their retention by students. They include: 1) Conceptual, which are global, and generalizable to other times and places, 2) Significant Knowledge, which provides knowledge to understand a concept locally where it can be experienced through sensory-rich being there experiences, and 3) Skills, for example math, language arts, social studies, geography, and science skills needed to complete inquiries (Pates, 2011).

Inquiries and Gardner's Multiple Intelligences as a Framework for Integration. Much of the integration of curricular themes and theme components incorporates Howard Gardner's "Multiple Intelligences" through use of inquiries. These are based on teacher-facilitated student learning activities that employ diverse components of Howard Gardner's "Theory of Multiple Intelligences." Gardner developed the theory as an alternative to the I.Q. test, the traditional measure of intelligence for evaluating human potential (Freuder, 2007).

Through pattern-seeking and mental program development activities, multiple intelligences create more memorable and integrated learning. As "cognitive pathways" that students possess, multiple intelligences influence what, and the ways (instruction styles, modes) that material is presented by teachers (like the use of science notebooks, environmental camps) (Pates, 2011)

Learning Lessons, and Lesson Activities including Inquiries. Lessons are taught in Highlands' classrooms and sometimes on Highlands' school grounds. Learning lessons and activities at Highlands are framed within the understanding that students acquire knowledge best when learning in context of coherent "whole," and relate their learning to the "real world." A lesson is a structured period of time where learning is intended to occur, involving one or more students being taught by a teacher or instruction specialist. A lesson may be, for instance, one section of a textbook or multimedia item, or, more frequently, a short period of time during which learners are taught about a particular subject or how to perform a particular activity (Pates, 2011).

At Highlands, lesson activities, especially "inquiries," are used to apply, reinforce, and extend curriculum key points. These activities typically fall into the following learning modes: observation ("looking at" things), exploration (interacting with things), discovering (inquiring, seeing and/or learning something new), recording (for example, drawing), expressing (talking about), applying (for example, doing a calculation or solving a problem) and transferring (applying learning to another, perhaps similar situation, or to another person in their activities) (Pates, 2011).

Curricular Connections to Sensory-rich Locations. Emotions and emotional connections are "gatekeepers" to learning and performance. Movement (motor, psycho-motor skills, dexterity) enhances learning and is especially important for younger children and their emotional development and attachment. Highlands' curricular themes are coordinated with the sensory-rich properties of the school grounds' settings. The integrated curriculum and teaching and learning activities are best done in settings that afford sensory-rich "being-there" experiences. Such settings best engage all senses (site, sound, hearing, taste, smell, touch, temperature/thermal, humidity, vestibular/gravity position, and time/space) in activities, and also afford the opportunity for students to engage in, and help develop, the psycho-motor, dexterity, social, perceptive, affective, and cognitive characteristics of their human development. Teaching and learning in sensory-rich settings is also an important way that students can relate their learning to the "real world" (Pates, 2011).

Cooperative Learning. Cooperative learning is the instructional use of small groups so that students work together to maximize their own and each other's learning. Cooperative learning connects students, and entails a richer experience than a non-cooperative approach. It forms a

basis of the ITI approach at Highlands, and is based on the Johnsons' approach to cooperative learning, which includes academic and social goals, roles, and learning processing (Johnson, Johnson, and Holubec, 2009). To be cooperative, to reach the full potential of the group, five essential elements need to be carefully structured into the situation: positive interdependence, individual and group accountability, promotive interaction, appropriate use of social skills, and group processing (Johnson & Johnson, 1989).

The five basic elements may be effectively implemented in formal cooperative learning situations (may be used to structure most learning situations), informal cooperative learning situations (may be used to make didactic lessons cooperative), and cooperative base groups (used to personalize a class and the school). Together they provide an integrated system for instructional organization and design and classroom management. When using the three types of cooperative learning, any learning situations in any subject area with any age students and with any curriculum can be structured cooperatively (Johnson & Johnson, 1989).

Students at Highlands are paired, grouped, or teamed in almost all activities (including the processing and reporting of learning) whether working inside or outside. The number of students within cooperative learning groups at Highlands often varies (Pates, 2011).

Instruction Styles and Modes: Direct, Semi-direct, or Facilitated. The types of instruction at Highlands includes a mix of *Direct* (formal "teaching" to the students), *Semi-direct* (informal; student interaction with the environment is a prime motivating force, the teacher *facilitates* connections to curriculum), and *facilitated/non-formal* (instruction *using a wide range* of learning activities and instruction modes)(Pates 2011, p. 2.).

Multiple instruction modes (for example a teachers' modeling something) and cooperative tasks are used in instruction, no matter what the instruction style. Instruction modes are used to facilitate student learning, and are based on the learning cycle of observation, exploration, discovering, recording, expressing, applying, and transferring (Moore and Wong, 1997) (Pates, 2011).

CHAPTER 3: RESEARCH APPROACH AND METHODS

This chapter explains the research hypothesis, the research problem, and the characteristics of the three settings researched on Highlands' school grounds. The chapter explains the expert judgment approach in implementing the ITI affordances at each setting, and in developing the survey to measure teacher perception of affordances at each setting, and across settings. The chapter also explains the expert judgment approach to findings and analysis across settings, analysis of how and why teachers' and expert judgment's perceptions of affordances vary across settings, and analysis and interpretation of opportunities to improve the fit of teachers' perceptions of affordances with actual, or the author's (expert judgment) perceived affordances.

RESEARCH HYPOTHESIS, APPROACH, SETTINGS

Research Hypothesis

As noted earlier, the author hypothesizes that by identifying and interpreting Highlands Teachers' perceptions of the school grounds ITI affordances, and comparing the individual Teachers' perceptions with the expert judgment perceptions of "actual ITI affordances," opportunities for ITI curriculum and lesson activities, setting design, and for teacher training/professional development can be identified in ways that may improve the fit of the teachers' perceptions of affordances with the actual affordances (as perceived and interpreted by the Author using his "expert judgment"). Opportunities can be identified and interpreted at each setting, and across settings.

This is an interpretative study. The research questions were formulated to guide the operationalizing of this research; they also helped form the basis of the research approach, which is explained below.

Problem Identification

The overarching "problem" is that the "outdoor play and learning" settings on the school grounds at Highlands Elementary School (Highlands) in Edina, MN were originally planned, designed, and constructed for unstructured "play," not for teaching and learning. The

development of play areas after 2009 included a focus on learning in the settings in addition to play, creating a "multi-layered approach" to the site, geared towards play and learning by students of different ages, abilities, and stages of human development. Later settings included a raingarden, sensory and butterfly gardens, and a produce garden, created in 2010-2011.

Discussion with Highlands' teachers and staff, and the results of an autumn 2009 Highlands survey, suggested that the use of the "play area" settings in delivering the Highlands curriculum varied among teachers, and that some teachers were having difficulty understanding how the various settings could be used in delivering Highlands' ITI-based curriculum and lesson activities to students of various ages and abilities. They were unfamiliar with ways in which a setting's *attributes* could be used to realize their potential in educating Highlands' students. Some teachers were unaware, or partially aware, of the learning affordance opportunities that the "play area" settings, and settings' attributes, offered for implementing Highlands ITI approach in the school grounds outdoor settings.

Further discussion with Highlands' teachers and staff and principal, the conduct of a literature review, and discussion and analysis with University of Minnesota faculty resulted in the author focusing on this overarching problem, and identifying and creating the more detailed research questions below that form the basis of, and approach to, this study.

Research Settings: Selection, And Characteristics

Location and Selection of Research Settings at Highlands Elementary School. This research examined three outdoor settings on Highlands' school grounds Located on the east side of the Highlands school, the three settings include, from north to south (right to left in Figure 3-1) are the Literary Park, the East Lawn, and the Raingarden. The Literary Park and East Lawn are adjacent each other; the Raingarden is separated from the East Lawn by a dry streambed, a play structure, and a mound with circular rock seating. Setting selection was based on the setting design (including a range of types and a mix of setting features/elements), age, location (not too far from the central school doors on the east side of the building), teacher feedback regarding settings' use from a previous survey, and discussion with Highlands's teachers and Principal Hodne. Also, providing a manageable number of sites that teachers could/would evaluate further reinforced the need to limit the number of settings researched to three.

Figure 3-1 highlights the location of the three settings on the east side of the Highlands school grounds. The map also served to locate the settings for teachers participating in the survey.

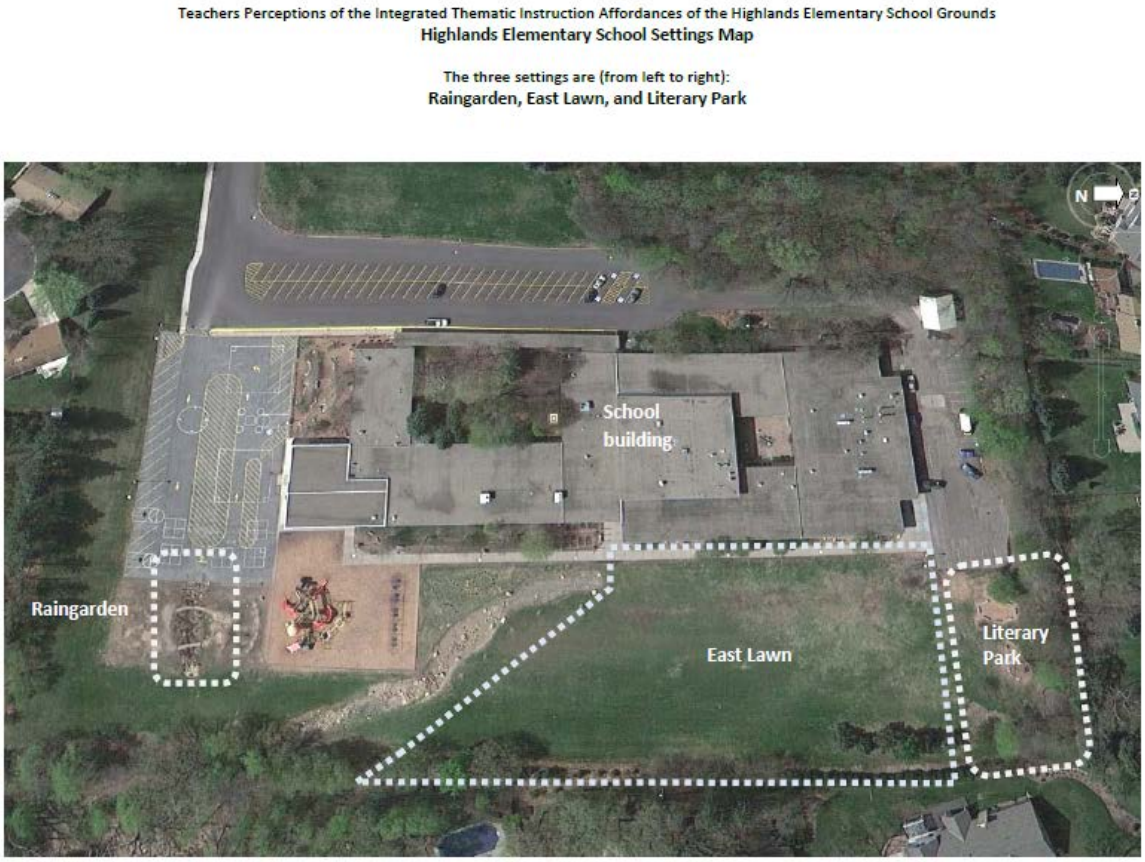

Figure 3-1. Map of Highlands School Grounds Study Settings Included in Teachers' Survey.

Research Settings Characteristics. In theory, the process of planning and designing school ground settings involves the choice and assembly of the settings elements – typically built/fixed features, loose parts, natural phenomena, and populations of people and organisms (for example, animals, birds) using, or likely to use the setting. Each setting is designed to combine (or naturally acquire) a mix of the biotic, abiotic, found, or constructed (built) characteristics of the settings' elements. The Author identified and interpreted the ITI affordances of each setting's elements. The author also used a detailed Settings' Inventory and Analysis Data Spreadsheet to inventory, identify, catalog, characterize, interpret, and rate the settings' elements ITI affordances as perceived by the author based on professional judgment (see Appendices).

The Settings' Data Spreadsheet was also used as a template to compile, analyze, and interpret data from the Teachers' surveys; only the elements on the Teachers' survey were used in direct comparisons in analysis and interpretation of findings. In this way, there was a direct relationship in analyzing and interpreting both the expert judgment and teachers' perceptions of each setting's ITI affordances. The complete set of detailed setting inventory and analysis spreadsheets can be found in the Appendices. Descriptive information pertaining to each setting is summarized below. These summaries pertain to the presence of biotic elements, built/fixed elements (e.g. seating) in the environment, loose parts that students and teachers can move, and organisms (both human and other).

Literary Park Setting. Figure 3-2, Figure 3-3, and Table 3-1 provide descriptive information for the Literary Park Setting. The author's overall inventory of the Literary Parks' setting elements included:

- Biotic elements: trees and shrubs, grass and Abiotic soil/dirt, rock with sign, woodchips.
- Built/Fixed: wood benches and rock seating (also gathering/meeting places, and informal stages), art bench, entrances semi-defined, open area semi-open, fences/enclosures.
- Loose Parts: rocks/stones.
- Organisms: potential people; individuals, pairs, groups/teams, and class. Potential organisms other; animals, birds, insects, amphibians, reptiles.

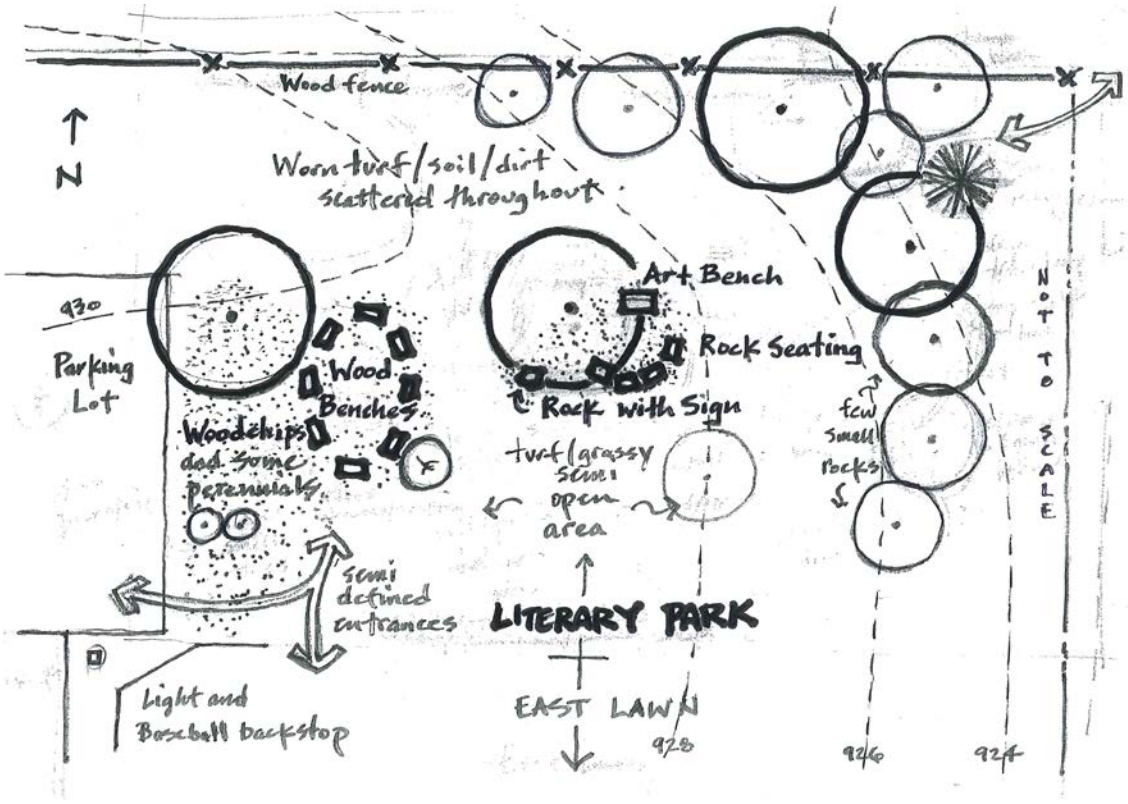

Figure 3-2. Literary Park Setting (7/13/2012).

Table 3-1. Presence, mix of types, and characteristics of setting elements at Literary Park

LITERARY PARK SETTING							
Estimated Size: 15,500 sq. ft.	**Presence and mix of types, and characteristics of setting of elements**						
Design and Diversity	Biotic	Abiotic	Found	Built	Loose Parts	Potential Populations: People	Populations: Organisms
Interior Elements	X	X		X	X	X	X
Edge Elements	X	X	X	X	X	X	X
"Distance"	Northern-most setting; north of East Lawn						

Figure 3-3. Literary Park Setting, looking east (7/13/2012).

East Lawn Setting. Figure 3-4, Figure 3-5, and Table 3-2 provide descriptive information for the East Lawn Setting. The author's overall inventory of the East Lawn's setting elements included:

- Biotic elements: trees and shrubs at far edge of lawn, open grass area, and Abiotic soil/dirt-also in worn turf, hill and swale along far edge.
- Built/Fixed: pavers/step stones-logs at the edge, sidewalk along the edge, baseball backstop and infield, lights (et edge), and views of the adjacent gardens and playground with manufactured play equipment.
- Loose Parts: none.
- Organisms: potential people; individuals, pairs, groups/teams, and class. Potential organisms other; animals, birds, insects, amphibians, reptiles.

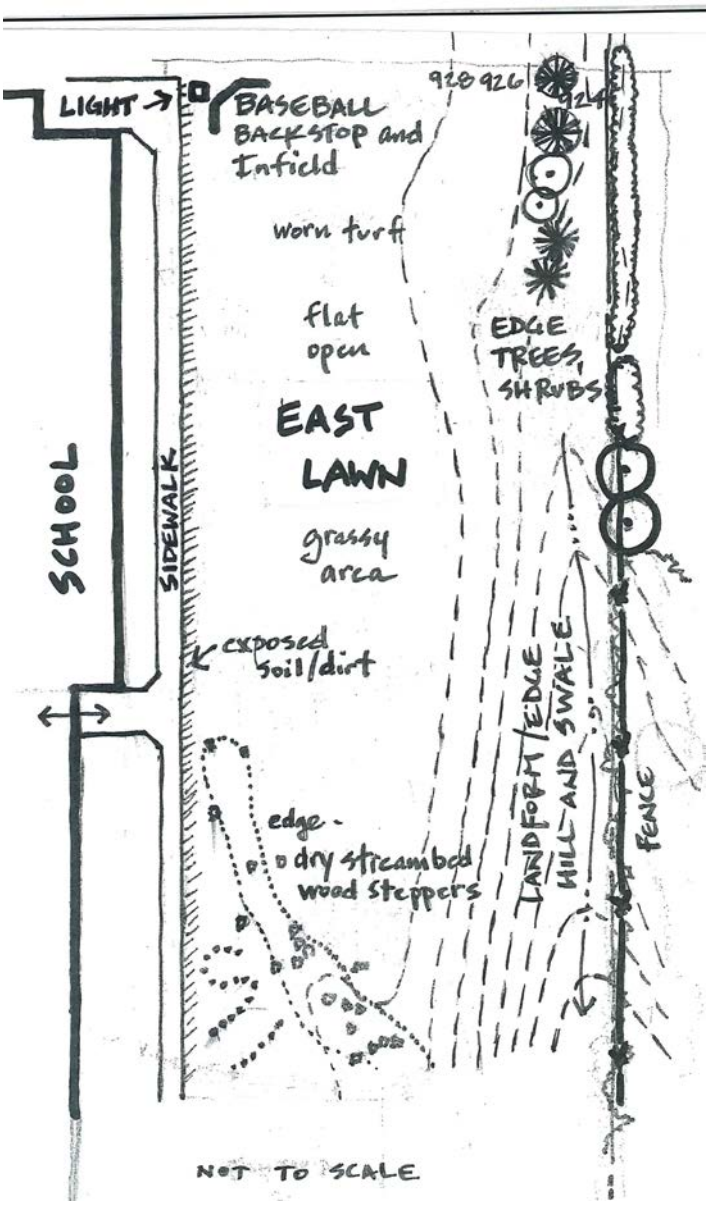

Figure 3-4. East Lawn Setting (3/25/2012).

Table 3-2. Presence, mix of types, and characteristics of setting elements at East Lawn

EAST LAWN SETTING							
Estimated Size: 42,000 sq. ft.	**Presence and mix of types, and characteristics of setting of elements**						
Types, mix, choice, & assembly of elements	Biotic	Abiotic	Found	Built	Loose Parts	Potential Populations: People	Populations: Organisms
Interior Elements	X	X		X		X	X
Edge Elements	X	X		X		X	X
"Distance"	Centered on east side of school/center doors; some edge elements at (far) east edge of setting						

Figure 3-5. East Lawn Setting, looking north towards Literary Park (3/25/2012).

Raingarden Setting. Figure 3-6, Figure 3-7, and Table 3-3 provide descriptive information for the Raingarden Setting. The author's overall inventory of the Raingarden's setting elements included:

- Biotic elements water, trees and shrubs, perennials/wildflowers, grass, and Abiotic sand/soil/dirt, rocks/stones
- Built/Fixed: Gardens (also a gathering/meeting place), pavers/step stones-logs, drain inlet at curb and stones, wooden walkways, wood fence, Area semi-open and entrances semi-defined, landforms hill and swale, and views of the pond
- Loose Parts: rocks/stones
- Organisms: Potential people; individuals, pairs, groups/teams, and class. Potential organisms other; animals, birds, insects, amphibians, reptiles

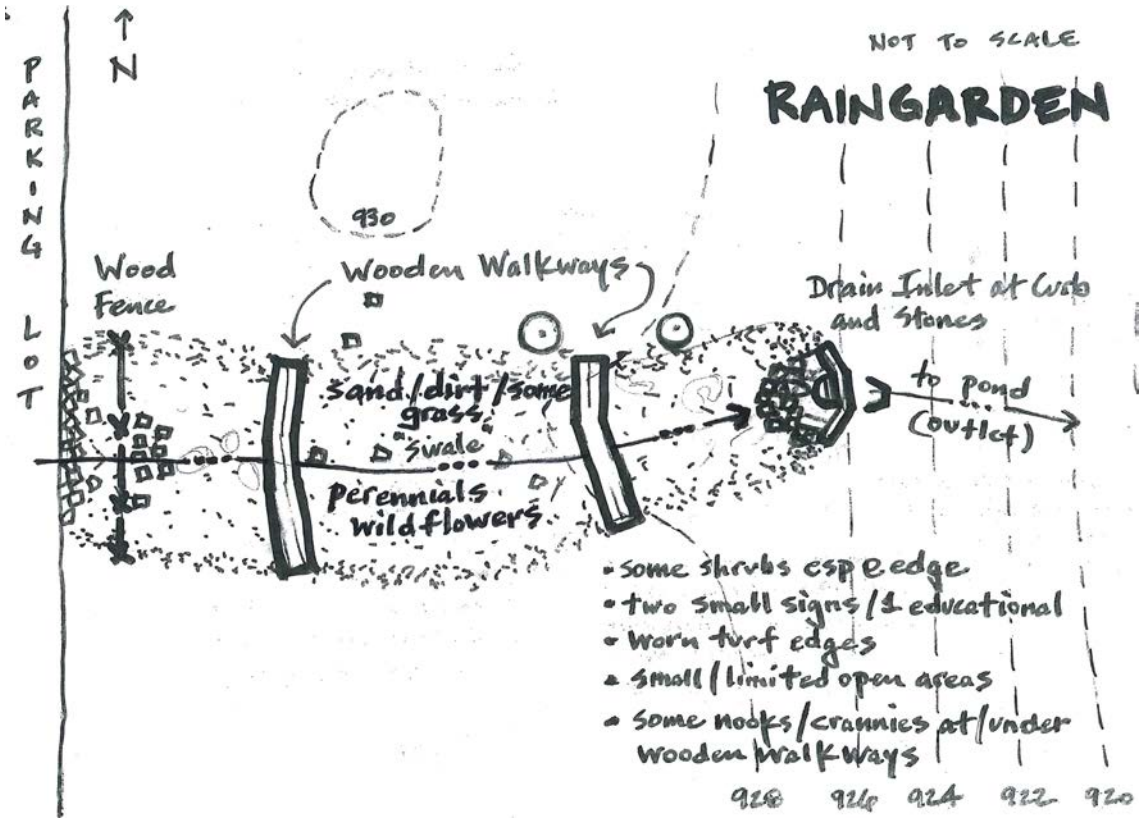

Figure 3-6. Raingarden Setting (12/27/2011).

Table 3-3. Presence, mix of types, and characteristics of setting elements at Raingarden

RAINGARDEN SETTING							
Estimated Size: 2,000 sq. ft.	**Presence and mix of types, and characteristics of setting of elements**						
Types, mix, choice, & assembly of elements	Biotic	Abiotic	Found	Built	Loose Parts	Potential Populations: People	Populations: Organisms
Interior Elements	X	X	X	X	X	X	X
Edge Elements	X	X		X		X	X
"Distance"	Southern-most setting; south of mound with circular seating						

Figure 3-7. Raingarden Setting, looking over Wood Fence towards east (12/27/2011, winter).

DEVELOPING AN EXPERT JUDGMENT APPROACH FOR IDENTIFYING AND EVALUATING AFFORDANCES FOR IMPLEMENTING THE ITI CURRICULUM AT EACH SETTING

This discussion explains the research approach and expert judgment methodology used by the Author to respond to research question 1:

How does Expert Judgment interpretation of affordance presence and suitability relate to statewide/district curriculum standards and lesson activities? Technically speaking, how do curriculum and lesson activity affordances of the Literary Park, East Lawn, and Raingarden relate to those standards and activities?

These questions were examined in terms of identifying the presence of an affordance in a particular setting followed by evaluating the strength of the affordance. Both the identification and the evaluation of the affordances are based on expert judgment of the Author.

Expert Judgment Identification of Affordances

Statewide and district curriculum standards and lesson activities guided the identification, analysis and interpretation of ITI curriculum and lesson activity affordances of the Literary Park, East Lawn, and Raingarden. After identifying key statewide and district curriculum standards and lesson activities, the Author selected curriculum strands, substrands, and standards and benchmarks most closely associated with and provided the best "fit" with Highlands' Integrated Thematic Instruction (ITI) approach in the school grounds.

For Science, the author identified elements at each of the settings that related to the curriculum strands of Nature of Science and Engineering, Physical Science, Earth and Space Science, Life Science, and Interdependence of Living Systems and their related standards and benchmarks. The selected Science strands come from those recommended by former Prior Lake/Savage School District teacher Cara Rieckenberg (Rieckenberg, 2009) as providing the "best fit" when teaching science outdoors. For Health curriculum, the curriculum strands of Food for Health and Fitness, Growing and Learning, Being and Keeping Safe, and Staying Fit and Healthy were selected. For Social Studies, the strands of Concepts of Location, Places and Regions, Human/Environment Interaction, and Government and Citizenship were selected.

For affordances related to student inquiry via Gardner's Multiple Intelligences, the setting elements were identified on the basis of their capacity to engage each of the eight "intelligences." The Author selected and used the "intelligences" in the same manner as done with curriculum strands, substrands, and standards and benchmarks most closely associated with and provided the best "fit" with Highlands ITI approach in the school grounds. The intelligences include: "linguistic" (word smart), "logical" (mathematical-number/reasoning), "spatial" (picture and space/relationships), "bodily/kinesthetic" (movement), "musical," "interpersonal" (people), "intrapersonal" (self), and "naturalistic" (nature smart regarding plants, animals, environmental aspects).

Much in the same manner as in the use of curriculum components and intelligences, the author selected common sensory faculties most closely associated with and providing the best Teaching that uses Student's Senses and the Sensory Richness "fit" with Highlands ITI approach in the school grounds. Teaching that uses Student's Senses and the Sensory Richness of setting elements was based on the sensory faculties of hearing, taste, touch, smell, visual/seeing, thermal/temperature, humidity, time/space, and vestibular (gravity and position). The natural phenomena affordances of elements and their sensory faculties were considered in combination with the faculty itself (i.e. visual faculty and the ability to sense sun/shade/shadow affordances). The sub-strands and benchmarks used to identify relevant setting elements for science are presented in the Appendices.

A Settings Inventory and Analysis Data Spreadsheet was developed and used by the Author to identify, inventory, organize, characterize, and analyze and interpret the significant setting elements and their affordances based on the presence, mix, and types of biotic, abiotic, found, and built elements in each of the three researched settings. Settings' Inventory and Analysis Data Spreadsheets for each setting can be found in the Appendices.

The spreadsheet graphic presented in Figure 3-8 below illustrates the structure of the Setting's Inventory and Analysis Data Spreadsheet, using the Raingarden setting as an example. Setting element types and setting elements themselves are on the left –vertical axis, and curricular and lesson activity affordance opportunities, including curriculum strands, intelligences, and sensory faculties are on the horizontal axis.

Raingarden Setting		**Affordance Type**				
Setting Element Types and elements		**Curriculum**			**Lesson Activities**	
		Science -including relevant sub-strands, standards, benchmarks	**Health** -including relevant sub-strands, standards, benchmarks	**Social Studies** -including relevant sub-strands, standards, benchmarks	**Gardiner's modes of inquiry** -linguistic, logical, etc.	**Sensory learning and richness** -hearing, taste, etc.
Biotic	Water					
	Trees and shrubs					
	Perennials-wildflowers					
	Grass					
Abiotic	Sand/soil/dirt					
Found objects						
Loose parts						
Built/fixed	Drain inlet at curb, and stones					
	Wooden walkways					
	Wood fence					
Organisms	Birds					
	Insects					
	Amphibians					
	People					

Note, Distance from the classroom was not directly rated by the Author, but it was qualitatively factored-into the rating of a settings "edge elements" furthest away from classrooms or the school-buildings east/central doors.

Figure 3-8. Graphic Illustrating the Structure of the Setting Inventory and Analysis Data Spreadsheet, using the Raingarden Setting as an Example.

Expert Judgment Evaluation of Affordance Strength

Significant elements in each setting were identified and affordances interpreted in the field at Highlands's school grounds by the author. A Settings' Inventory and Analysis Data Spreadsheet

(aka Settings Data Spreadsheet) was developed and used to identify, inventory, organize, characterize and interpret the significant elements and their affordances by their presence, and the mix, and types of biotic, abiotic, found, and built elements in each setting. Also identified and interpreted were the choice and assembly of fixed/built features, found elements, loose parts, and existing and potential populations of people (as individuals, in pairs, groups, or as a class) and organisms (i.e. mammals, birds).

Note that a draft of the author's Settings' Data Spreadsheet and ITI affordances rating approach was reviewed by the author's University of Minnesota L.A. Master's committee, and some Highlands teachers and Highlands Principal Peter Hodne; minor changes were made based on their comments.

The author analyzed, interpreted, and rated the strength (or suitability) of the ITI curriculum and lesson activity affordances of each element at each setting. An author-developed suitability scoring system was used to assign a number to rate each element's suitability strength. At each setting, each setting element was first rated regarding the strength of its individual ITI science, health, and social studies curriculum STRAND (for example, Nature and Science of Engineering) affordances, and lesson activity affordances relative to Gardiner's eight intelligences, and sensory faculties (for example, visual or hearing). Strand affordance ratings were created by using a gestalt approach to synthesize affordance ratings across the multiple curriculum sub-strands and standards and benchmarks contained within each strand across grades 1 through 5. Ratings ranged from 1 (lowest) to 5 (highest). Then, individual benchmark, intelligence, and sensory faculty scores were summed and a mean calculated for each element by curriculum category (science, health, social studies), for inquiry via multiple intelligences, and for teaching that uses students' senses/sensory richness.

At each setting, the strength by Element Type (for example biotic element type) was calculated; for example, the rating of individual "biotic elements" like water were summed and a mean calculated (across the spreadsheet) to develop a number indicating the relative affordance strengths of the Element Type. Also at each setting, the strength of each element relative to the provision of affordances for presenting the science, health, and social studies curriculum component, and the lesson activity of student inquiry via Gardner's theory of multiple intelligences, and teaching using student' senses/sensory richness, were calculated. Individual element affordance strength ratings were summed down the curriculum or lesson activity column

in the spreadsheet and a summary mean calculated (see the Literary Park setting example Settings Data Spreadsheet in Figure 3-9).

The data and process described above enabled an "Overall" expert judgment interpretation of the settings' ITI affordances because it rated all the setting elements included in the Settings' Data Spreadsheet. These data were subsequently compared with teacher ratings of element affordances as recorded in the Teacher Survey data, survey Question 4, which will be described in a subsequent section of the thesis.

A second, direct "element-to-element" comparison of the author's and Teachers' ratings of ITI affordances used, analyzed, and interpreted only the setting elements included in the Teachers Survey (not including Question 4 in the teachers survey). This will be described in a subsequent section of the thesis. The setting elements included in the Teachers Survey were selected to provide a comprehensive, relevant representation by element type (for example biotic trees and shrubs) of elements that contributed curriculum and lesson activity affordances at each setting.

BEHAVIOR SETTINGS							
AND TEACHERS' PERCEPTIONS							
OF ITI AFFORDANCES							
HIGHLANDS ELEMENTARY		EXPERT	SCIENCE	HEALTH	SOC STUDIES	INQUIRY	SENSORY
SCHOOLGROUNDS		JUDGEMENT	AVERAGE	AVERAGE	AVERAGE	AVERAGE	AVERAGE
LITERARY PARK Setting	Elements RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high					
Plan, Design; Elements, Characteristics		Key Setting Elements					
Mix of Types of Elements	Biotic	water					
	also in 'other organisms'	trees -edge 8, int 4, 1 shade, shrubs 1	2	2	2	2	2
		perennials/wildflowers					
		herbs/produce					
		turf/grass -worn	1	1	1	1	2
	Abiotic	sand					
	some in 'loose parts'	soil / dirt, in worn turf	1	1	1	1	1
	Found	nests?					
		nooks and crannies					
		drain pipes / outlets					
	Built	gardens					
	some in 'fixed features'	class circles/seating	4	4	4	3	2
		bird/animal houses					
		pond / streambed					
		wind devices/chimes					
		pavers/step stones					
		forts/shelters/lookouts					
		gather/meeting places (2)	3	3	3	3	2
		stages; informal benches, rocks	2	2	2	2	2
		storage / field station					
Choice, assembly of elements	*Fixed Features*						
	some in 'built'	entrances, semi-defined	1	1	2	2	1
		pathways					
		signs/displays, limited on rock	1	1	1	2	1
		landforms/topo					
		open area, semi-open	1	1	1	2	1
		fences/enclosures, edge; 1 maple tree canopy	1	2	2	2	1
		surfacing -woodchips	2	1	2	1	2
		benches / sitting features	2	2	2	3	2
		art bench	2	2	2	3	2
		manu play equipment					
		multipurpose/games					
		water spigots / hoses					
	Loose Parts	small rocks -very few	1	1	1	2	1
		logs / trees					
		play props					
	Populations	*People (potential)*					
		Individual	3	3	3	3	2
		Pair	4	4	4	4	2
		Group/Team 3+	5	5	5	5	2
		Class	4	4	4	4	2
		Organisms (exist, potential)					
		mammals, lessor/exposed	1	1	1	1	1
		birds, lessor veg diversity	2	1	1	1	1
		insects, lessor, not diverse	1	1	1	1	1
		fish / aquatic					
		amphibians, lessor, not diverse	1	1	1	1	1
		reptiles, lessor, not diverse	1	1	1	1	1
		farm / domestic					
Setting Diversity			48	44	47	50	37
Based on having Elements in all Categories							
Number and types of Elements in Categories		hand sum	46	45	47	50	35
updated 121217							
only had sum numbers are correct at bottom							

Figure 3-9. Example: Literary Park Settings' Data Spreadsheet; Used by Author to Inventory, Analyze, Interpret, and Rate each Setting Elements' ITI Curriculum and Lesson Activity Affordances.

Summary means were categorized into low, medium, and high affordance/suitability ranges. Mean values of less than 1.9 were categorized as "low;" values between 2.0 and 2.6 were

categorized as “medium,” and those above 2.6 were categorized as “high.” Category break points were developed based on dividing the rating range (1 “low” to 5 “high”) into equal intervals. Based on visual inspection of both expert judgment, and teacher data, the ranges were later adjusted to the adjusted equal intervals as noted above. Adjustment compensated for the Author’s consistently low rating of elements, for the “0” rating interpreted and assigned to questions that teachers skipped in the teachers survey, and to help create a level of consistency in the ratings by the author and teachers.

Statistical analysis was used to cross-check the adjusted ratings. Teacher’s survey data was used to calculate “Z” and “P” scores; this analysis produced “Low-Medium-High” ranges largely consistent with those adjusted non-statistically.

DEVELOPING AN AFFORDANCE SURVEY INSTRUMENT TO MEASURE TEACHER PERCEPTION OF AFFORDANCES AT EACH SETTING

Research Question 2 aimed to provide insight on the following issues: How do Teachers think that site elements at each setting compare in their perceived suitability, or affordances, for teaching Science, Health, Social Studies, in Student Inquiry, and Sensory Rich lesson activities? Which setting elements are suitable, or afford, teaching of curriculum and lesson activities? How suitable are they? Research Question 3 asks how teacher perceptions of educational affordances vary across settings.

The author developed and implemented an on-line survey of individual teacher's perceptions of affordances provided by the elements of each of the three research settings for implementing the ITI curriculum as practiced at Highlands Elementary School. The survey was executed using Survey Monkey software (SurveyMonkey Inc) Survey data were downloaded from the on-line survey website as Microsoft Excel summary spreadsheets.

Teachers' Survey and Survey Timeline

Selected teachers at the Highlands Elementary School participated in a survey designed to examine their individual perceptions of affordances provided by site elements contained in three learning and play settings in the school yard for implementing the school's ITI curriculum. The use of a survey approach to examining teacher perceptions was based on recommendations of Highlands's teachers and Principal Hodne, on information from the literature review, and on discussion with the author's Masters committee members.

Surveys are widely used in educational and psychological research and can be used for a wide variety of purposes. Surveys allow collection of data from a larger number of people; and they rely on individuals' self-reports of their knowledge, attitudes, or behaviors. Validity of information is contingent on the honesty of the respondent. During the survey design phase and survey presentation, the author articulated the survey purpose, stated specific objectives, considered types of information needed, and evaluated options (Mertens 2005).

Based on typical survey protocols, non-threatening perception and behavior questions were asked of participants about their perceptions, which assessed and measured teacher attitudes

and perceptions of affordances and affordances strengths for implementing ITI curriculum strands and lesson activities in the three settings (for example, How much…). The magnitude of strength was limited to a five point rating scale, which is usually the recommended limit in the survey practices and protocols guidance (Mertens, 2005).

Selection of Teacher Survey Participant Sample. Based on recommendations by Highlands teachers and Principal Hodne, an opportunity sample of 22 Highlands teachers providing instruction in grades one through five were invited by the author and Principal Hodne (by email and at a staff meeting) to voluntarily participate in the research by completing an on-line survey containing 37 questions that would explore their perceptions of ITI affordances of the three research settings. Teachers who participated in the two-part on-line survey completed the first part of the survey on October 29, 2012 at a Highlands Teachers' professional development day meeting. Teachers were invited to participate in the second part of the survey starting on October 30, 2012. The survey was closed to participation on November 26, 2012.

Survey Administration, Structure, and Content. Teachers participating in the survey reviewed and signed a participation consent form. The research and the first part of the survey (known hereafter as Survey 1) were introduced by Principal Hodne and the Author at a teachers' professional development meeting at Highlands. Teachers were also asked to answer the remaining questions (known as Survey 2) within a two to three-week time period. The survey was administered in two parts as time did not permit allowing the teachers to complete the entire survey while meeting with Principal Hodne. As an on-line survey, participants could return to and complete the second part of the survey (also known as Survey 2) at their leisure. It was anticipated that not all teachers would complete the entire survey, and that given the interpretative nature of this study, 12 to 15 completed surveys would be an adequate sample to illuminate and interpret the data and major themes of the teachers' perceptions of the settings' ITI affordance

The first three questions of the teachers' survey (see Appendices) asked participants to identify the grade(s) or programs in which they currently teach, the number of years they have been teaching at the Highlands School, and whether they have used the Outdoor Play and Learning areas in their teaching. For each of the outdoor learning and play settings (that is the Literary Park, the East Lawn, and the Raingarden), subsequent questions asked participants to:

- *Rate the "suitability" of the setting for teaching using the ITI approach and each of the key ITE curriculum subjects (science, health, and social studies)* on a scale of one to five. Asking about "suitability" was a window into illuminating teachers' perceptions of the a) the science, health, and social studies curriculum affordances and strengths of perceived affordances.
- *Identify features actually found in the setting that made it suitable for teaching each of the key ITI curriculum subjects and to rate the top four elements at each setting.* Asking about these features framed the connection between perceived affordances of a setting, setting diversity and design, and the probable actual affordances.
- *Rate the "suitability" of the setting for student inquiry (based on Gardner's Multiple Intelligences)* on a scale of one to five.
- *Identify features actually found in the setting that made it suitable for student inquiry (based on Gardner's Multiple Intelligences) and to rate the top four elements at each setting.* Asking about the features of a setting that made it suitable for student inquiry (based on Gardner's Multiple Intelligences) framed the connection between the perceived inquiry affordances of a setting, setting diversity and design, and the probable actual inquiry affordances (expert judgment) based on behavior setting affordance theory.
- *Rate the "suitability" of a setting for creating "sensory-rich being there" experiences for students* on a scale of one to five.
- *Identify features actually found in the setting that made it suitable for "sensory-rich being there" experiences for students and to rate the top four elements at each setting.* Asking about these framed the connection between the perceived affordances of a setting, the setting's diversity and design, and the probable actual sensory richness of the setting and its "sensory-rich being there" experience affordances (expert judgment) based on outdoor behavior setting affordance theory.

Analysis of Survey Data

Survey Data Downloading and Compiling. In the process of recording, compiling, rating, analyzing and interpreting the individual teacher's ratings of their perceptions of the presence and suitability/strength of the ITI affordances at each of the three research settings, the author first downloaded summary information (survey data and comments) for each survey question. Each

setting element in the survey was rated by the Teachers regarding its strength relative to the provision of affordances for presenting the science, health, and social studies curriculum components, and the lesson activity of student inquiry via Gardner's theory of multiple intelligences, and teaching using student' senses/sensory richness. This data was then inserted into the same Settings' Data Spreadsheets used by the author to record expert judgment data and evaluate affordance presence and strength. In the survey, teacher also made comments; which were and interpreted, in combination with data in the spreadsheets, in this thesis to illuminate and interpret any themes derived from data and teacher comments.

As noted earlier and illustrated in Figure 3-5, the Settings' Data Spreadsheets were used to characterize and organize setting elements as rated by teachers' regarding element presence, and the mix and types of biotic, abiotic, found, and built elements in each setting. Also identified and evaluated were the choice and assembly of fixed/built features, loose parts, and existing and potential populations of people (as individuals, in pairs, groups, or as a class) and organisms (i.e. mammals, birds).

As an affordance factor, the "distance from the classroom" was not queried directly in the survey. Teachers could fill-in "other" elements in survey questions or make comments at the end of the set of questions for each setting; some Teacher's did fill-in "other" and/or make comments, including comments regarding "distance" as an affordance factor.

Evaluating Affordances at Each Setting. This section describes analysis methods used in evaluating the teachers' survey data at each site, seeking information relative to research question #2. The section describes the evaluation of the data as they pertain to teacher rating of the *overall* suitability of the settings for each teaching affordance. This is followed by a discussion of methods used evaluating the contribution of setting elements to affordance scores.

Evaluating <u>Overall</u> Suitability of Settings for Each Teaching Affordance. In evaluating the overall suitability of each setting for teaching curriculum strands relating to Science, Health, and Social Studies, using lesson activity components derived from Student Inquiry based on Gardner's Multiple Intelligences, and for Teaching that Uses Students' Senses, survey Question 4 data was used, and a weighted summary was calculated for each curriculum and lesson activity component. These summaries were then divided by the response count to derive a mean

summary rating. As a means of illustrating the calculation of these data, Figure 3-10 below presents the summary mean ratings (are labeled "weighted average") at the three settings.

4. How suitable are the following Outdoor Play and Learning Areas for the curriculum and activities listed? (Please rate, 1 = low, 5 = high)							Calc num 19 Weighted Average
Literary Park							
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**	
Teaching Science	10	3	5	1	0	19	**1.8**
Teaching Health	13	4	2	0	0	19	**1.4**
Teaching Social Studies, including Geography	11	3	3	2	0	19	**1.8**
Student Inquiry, based on Gardner's Multiple	6	5	2	2	4	19	**2.6**
Teaching that Uses Students' Senses	2	6	5	2	4	19	**3.0**
East Lawn							
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**	
Teaching Science	10	1	6	2	0	19	**2.0**
Teaching Health	5	2	10	2	0	19	**2.5**
Teaching Social Studies, including Geography	10	3	5	1	0	19	**1.8**
Student Inquiry, based on Gardner's Multiple	5	8	3	1	2	19	**2.3**
Teaching that Uses Students' Senses	6	6	3	2	2	19	**2.4**
Raingarden							
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**	
Teaching Science	0	2	5	5	7	19	**3.9**
Teaching Health	11	7	1	0	0	19	**1.5**
Teaching Social Studies, including Geography	10	2	7	0	0	19	**1.8**
Student Inquiry, based on Gardner's Multiple	1	2	5	3	8	19	**3.8**
Teaching that Uses Students' Senses	0	0	4	7	8	19	**4.2**
						Question Totals	
					answered question	**19**	
					skipped question	**2**	

Figure 3-10. Survey1 Question 4 Mean Summary Ratings of Teachers' Perceived "*Overall*" Suitability of School Grounds Settings for Teaching ITI Curriculum and Lesson Activities.

One-way Analysis of Variance (ANOVA) was used to identify the existence of significant ($p<.05$) differences among the five overall summary mean affordance ratings (science, health, social studies, inquiry, and senses) at each setting. The five affordance measures were used as main effects and they were compared at each of the three settings. As appropriate, affordance means were separated into homogeneous subsets using post-hoc comparisons of means and the Least Square Difference (LSD) method of mean separation. This enabled the identification of clusters of affordance score mean for each setting's affordance scores.

Evaluating Strength/Contribution of Setting Elements to Affordance Scores. In evaluating the affordance "suitability" of each setting element for teaching curriculum strands

relating to Science, Health, and Social Studies, using lesson activity components derived from Student Inquiry based on Gardner's Multiple Intelligences, and for Teaching that Uses Students' Senses, a weighted summary was calculated for each survey question and setting element relative to the strength of its curriculum and lesson activity component affordance at each setting. Weighted summary ratings were then divided by the response count to derive a mean summary rating. This data was then inserted into "teachers' findings tables" (using a condensed version of the Settings' Data Spreadsheet), created for each setting.

At each setting, using the "findings tables", the Element Types (i.e. biotic, abiotic elements) were totaled and a mean Element Type rating was calculated (rows summed and averaged across the spreadsheet). ITI curriculum and lesson activity component affordances summary means were also calculated (columns summed and averaged down the spreadsheet using "raw" summary means data) to calculate the relative affordance strengths of curriculum and lesson activity components.

In performing statistical analysis (ANOVA), cell means were calculated for the intersection of each setting element and curriculum and lesson activity affordances. As illustrated in the example "teachers' findings table" in Figure 3-11 below, statistical summary means of the affordance scores for each setting element were calculated across all five affordance measures.

As noted earlier, the summary means scores were categorized into three groups: low (1.0-1.9), medium (2.0-3.6), and high (> 3.6).

Elements on Teachers' Survey	Curriculum			Lesson Activities		
	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Trees and Shrubs	3.5	2.1	3.0	**3.9**	**3.7**	3.2
Grass	2.8	2.0	2.7	**4.2**	**3.8**	3.1
ABIOTIC - Soil / Dirt	3.2	1.7	2.3	**3.9**	3.6	2.9
Rock with Sign	0.0	1.0	2.0	0.0	0.0	0.0
Woodchips	2.5	1.0	1.0	***5.0***	3.0	2.5
BUILT/FIXED - Wood Benches & Rock Seating	3.3	2.9	3.5	**3.7**	***5.0***	3.7
Art Bench	2.0	1.7	2.0	2.0	***5.0***	2.5
ORGANISMS - Animals	2.8	2.0	2.0	3.5	2.3	2.5
Birds	3.0	2.5	2.3	3.5	3.0	2.9
Other						
Statistical Summary Mean from ANOVA analysis (4/12/13 130313 rev 130508	**2.67**	1.78	**2.33**	**3.44**	**3.33**	2.71

NOTES:
Scores between 3.7 - 5.0 are rated High — **High**
Scores between 2.0 - 3.6 are rated Medium — **Medium**
Scores between 1.0 - 1.9 are rated Low — Low
Italicized right justified number: rating based on 1 response

Figure 3-11. Example of Teachers' Findings Table, using Literary Park setting.

For each setting, a suite of three tables was created to display the results of these separate analyses. As illustrated in the above narrative, the first table presented means calculated across the five affordance categories *for each setting element by type (for example, trees and shrubs, a biotic element type).* It also presents means calculated across the various setting elements *for each ITI curriculum and lesson affordance component category (for example, Science.*

For each setting, a table presented the setting elements arrayed into categories based on the strength (low (1.0-1.9), medium (2.0-3.6), and high (> 3.6) of their association with the five curriculum and lesson activity component affordance categories. This table permits a rapid assessment of elements that most strongly contribute to defining each of the five affordance categories.

Finally, results of the comparisons of overall affordance summary means at each setting using ANOVA with least squares differences as a mean separation criterion, allowed construction of a table to illustrate similarities and differences in overall affordance means at each setting.

An example of this suite of tables is presented for setting element contributions to affordance scores at the Literary Park Setting in Tables 4-LP1, 4-LP2, and 4-LP3; for the East Lawn setting in Tables 4-EL1, 4-EL2, and 4-EL3, while those for the Raingarden setting are presented in Tables 4-RG1, 4-RG2, and 4-RG3. A narrative, summarizing information in each

suite of tables was also developed. These narratives along with the suites of table are also found in Chapter 4. Teachers' comments as captured on the survey instrument were also included in the narratives and tables.

Examining Affordance Score Differences Across Settings. Research question #3 asks "[a]cross the three settings, how do teachers perceive the affordances of the settings for teaching science, health, social studies, in student inquiry, and sensory rich lesson activities? Accordingly this section describes methods used to evaluate teacher responses to the survey as they relate to a cross-setting comparison.

A repeated measures (that is, across the three settings) one-way Analysis of Variance (ANOVA) was used to identify the existence of significant ($p<.05$) differences among the three settings (Literary Park, East Lawn, and Raingarden) for each of the five *overall* summary mean affordance scores (science, health, social studies, inquiry, and senses). The three settings were used as main effects and they were compared for each of the affordance scores. As appropriate, setting summary means were separated into homogeneous subsets using post-hoc comparisons of means and the Least Square Difference (LSD) method of mean separation. This enabled the identification of clusters of similar site score summary means for each affordance score. The results of this analysis are presented in Table 4-T1 in chapter four. Table 4-T2 also presents a comparison of the ANOVA tests for differences in affordance score summary means at each setting. Statistical inferences in Table 4-T2 are limited to comparisons among the five affordance parameters at each setting. However, the table provides an overall sense of the strengths of the affordances provided at each of the settings.

For each of the five affordance component parameters (that is science, health, social studies curriculum, and student inquiry and teaching that uses students' senses/sensory richness lesson activities), a table presented the setting elements arrayed by setting into categories based on the strength (low (1.0-1.9), medium (2.0-3.6), and high (> 3.6) of their association with affordance categories. This table permits a rapid assessment of how the contribution of a setting element varied across the three settings for a particular affordance category. The cross-setting comparisons of setting element contribution to a particular affordance are presented in Tables 4-T5 through 4-T9 in chapter four.

COMPARING EXPERT JUDGMENT EVALUATIONS OF EDUCATIONAL AFFORDANCES ACROSS SETTINGS

Research Question 3 aimed to provide insight on the following issues: *Comparing Settings, how does Expert Judgment perceive the affordances of the three settings for teaching Science, Health, and Social Studies, and in Student Inquiry, and Sensory Richness lesson activities?*

The approach to evaluating ratings of expert judgment perceptions of education affordances across settings was similar to that done for the Teachers' Survey data. The main differences were:

- Given that the expert judgment evaluation involved a sample of one expert (that is, the author) no statistical analysis was done on Expert Judgment data. Summary means of the expert's judgments across several affordances and settings were reported, but no attempts have been made to statistically differentiate among mean scores.
- A table was prepared to compare the expert judgment of the affordance suitability of landscape elements present at each setting for teaching ITI Curriculum and Lesson Activity components across settings. To facilitate comparison with teacher perceptions, only elements also included in the teacher survey were incorporated into this analysis. This table was used to help compare expert's ratings of the individual element suitability ratings and their relative suitability strength rankings, across settings. It also facilitated analysis of how teachers' and the experts' evaluation of affordance suitability ratings varied across settings as implied in research question 4.
- The table above, in combination with the two tables comparing expert judgment's perceptions of suitability of the three settings for teaching curriculum and lesson activity components, was also used to prepare (based on visual inspection of data) a table comparing each setting's statistically homogeneous subsets of ITI curriculum and lesson activity components as perceived by expert judgment.

COMPARING TEACHERS' AND EXPERT JUDGMENTPERCEPTIONS OF ITI CURRICULUM AND LESSON ACTIVITIES AFFORDANCES ACROSS SETTINGS

Research Question 4 aimed to provide insight on the following issues: Do Teachers', and the Author's expert judgment perceptions of affordance presence and suitability vary across settings? How are the Teachers', and the Author's expert judgment perceptions different across settings, and what patterns exist in their perceptions across settings?

Research Question 5 aimed to provide insight on the following issues: If there are differences in the Teachers' and Expert Judgment's perceptions of affordance presence and suitability, why are there differences in perceptions?

General Approach

Given that Research Questions 4 and 5 are so closely inter-related, they are addressed together in interpreting data and findings in this thesis. The "teachers' survey elements ratings" are based on the author's ratings of each setting's particular curriculum or lesson activity affordances, but only for those setting elements contained in the teachers' survey.

Comparing Teachers', and Expert Judgment, Perceptions of Overall Teaching Affordance Across Settings

Teachers and Expert Judgment: Comparison of Variation of Affordances Across Settings (based only on elements in teachers' survey). Analysis and tables created in chapter 4 were used to compile and compare "perceived variations or differences" in data, and the findings, analysis, and interpretation for teachers and the expert judgment at each setting and across settings, using the data, and related summary means, from the elements included in the Teachers' Survey. The results were examined as a direct "element-to-element" comparison between ratings of the expert and those of the teachers. These comparisons were examined at each setting as well as across the three settings. Table 4-T/EJ1 in chapter four illustrates and presents the results of this analysis of variation and differences, by curriculum or lesson activity, across settings.

Teachers and Expert Judgment: Comparison of a Variation Across Settings (based on Clusters of Subsets of Curriculum and Lesson Activity Components). Tables were created in chapter 4 (separately for both teachers', and expert judgment - for example Table 4-EJ4) that compared clusters of conceptually related subsets of ITI curriculum and lesson activity components across settings. In order to compare teachers and expert judgment variation in this clustering across settings, a table was prepared that presented this information (Table 4-T/EJ2 in chapter 4); the number and types of clusters were compared, analyzed and interpreted. Where differences in clustering were found they were identified and inferences as to why the differences were postulated.

Teachers' and Expert Judgment; Comparison of Grouping of Setting Elements, by Curriculum or Lesson Activity, at Each Setting. In chapter 4, tables were created that compared the grouping of setting elements by their curriculum and lesson activity affordance category ranking (low, medium, high) across settings. Tables were created separately for teachers' and expert judgment's, comparisons. Information from these tables was combined to create a table that compared, by curriculum component, or lesson activity, the teachers' and Expert Judgment's grouping of setting elements, as previously categorized, across settings.

Each table also presents a comparison of the category rankings (low, medium, or high) by setting. This information is found at the top of each table, as is the categorized comparison of groupings of setting elements at and across settings. Teachers' comments were also added to the tables. An example of these tables is Table 4-T/EJ-Sci in chapter 4.

The tables, which also included teachers' comments, were used to analyze and interpret, variations and differences found in teachers' and expert judgment's categorization of elements, and the grouping of elements based categorization, across settings. Inferences as to why such differences may have been found across settings were also postulated.

APPROACH: OPPORTUNITIES TO IMPROVE THE FIT OF TEACHERS' PERCEPTIONS OF AFFORDANCES WITH ACTUAL/THE AUTHOR'S PERCEIVED AFFORDANCES

Research Question 6 aimed to provide insight on the following issues: *What opportunities can be identified for Curriculum and Lesson Activities at each Setting and across Settings, for Setting Design, and for Teacher Training/Professional Development, to improve the fit of Teachers' perceptions of affordances with actual, or the Author's perceived affordances?*

Findings and Interpretation of Teacher's, and Expert Judgment's Perceptions

The findings and interpretation of Teacher's, and Expert Judgment's Perceptions at Each Setting and Across Settings, were compiled, analyzed, interpreted, and inferences discussed regarding opportunities for curriculum and lesson activities, for setting design, and for teacher training.

Findings and interpretation of the comparison of Teacher's, and Expert Judgment's Perceptions at Each Setting and Across Settings, were compiled, analyzed, interpreted, and inferences discussed regarding opportunities for curriculum and lesson activities, for setting design, and for teacher training.

This information was then further synthesized to illuminate significant findings regarding opportunities for Curriculum and Lesson Activities at each Setting and across Settings, for Setting Design, and for Teacher Training/Professional Development that may improve the fit of Teachers' perceptions of affordances with actual, or the Author's (expert judgment) perceived affordances.

CHAPTER 4: FINDINGS

This chapter presents findings from both the expert judgment evaluation of ITI affordances in the three educational settings at Highlands Elementary School as well as the teachers' ratings of the presence of the educational affordances at the school grounds. The findings examine and compare the evaluations of expert judgment and teachers' ratings of affordances at each setting, a comparison of these two sets of ratings across the three settings, and an analysis of differences between overall expert judgment and teachers' perceptions.

TEACHERS' SURVEY PARTICIPATION AND TEACHER DEMOGRAPHICS

Teachers Survey Participation

Twenty-one of the Highlands teachers invited to participate in survey completed the first part of the survey (Survey1 questions 1 through 3).Of these, 19 responded to Survey1 Question 4, and 10 teachers responded to Survey1 questions 5 through 15 regarding the Literary Park setting. Twelve teachers responded to the second part of the survey, Survey2 questions 1 through 11 regarding the East Lawn setting, and Survey2 questions 12 through 22 regarding the Raingarden setting.

Teachers had the option of skipping the answering of questions about a setting if they felt that they did not have enough experience with the setting. Thirty-three (33%) percent of participants skipped responding to the survey questions regarding the Literary Park, 36% skipped the East Lawn, and 7% skipped the Raingarden questions (see Appendices).

Teachers' Survey Demographics

The 21 teachers completing the first part of the survey were fairly evenly represented across grades. Thirteen of the 21 teachers (62%) indicated that they taught in either the Continuous Progress or Discovery Program, and about 5% indicated they were [teaching] specialists for all grades. The majority of the respondents answered that they have been teaching at Highlands for more than 5 years, and about 15% indicated they have been teaching there for one to two years.

The majority of respondents (57%) indicated that last year (2011-2012 school year) they used the Highlands school grounds monthly. The weekly-use response was 19%. Five teachers indicated weekly use depending on the weather (weekly in warm seasons, monthly in winter), bi-weekly (including 1/2 day kindergarten teaching), and quarterly. The kindergarten teacher responded that "This year, I use it at least once a week, if not two times" (see Appendices).

TEACHERS' PERCEPTIONS AT EACH SETTING

Research Question 2 was: At each setting*, how did teachers think that the (existing) settings rated in their perceived suitability, or affordances, for teaching Science, Health, Social Studies, Student Inquiry, and Sensory Rich lesson activities?*

- *which elements were found suitable, or afforded, what teaching and lesson activities?*
- *how suitable were they? (based on ranking of 1.0-1.9 = low; 2.0-3.6 = medium; 3.7-5.0 = high)*

Teachers' Perceptions at Literary Park

Literary Park setting elements rated highest by teachers. Elements rated highest in ITI affordances across curriculum/lesson activities included wood benches and rock seating. Rated medium were trees and shrubs, and grass, as well as soil/dirt, and birds. Rated lower were woodchips, and the art bench. Lowest rated were the rock and the Literary Park sign (Table 4-LP1).

Curriculum/lesson activity summary means across all setting elements. Highest rated were for Student Inquiry. This rating was followed closely by teaching activities that use Students' Senses/Sensory Richness. Science, and Social Studies were rated medium and Health rated low in ITI affordances. In terms of Inquiry and Sensory affordances, wood benches and rock seating rated high, as did trees and shrubs, and grass. On the Inquiry and Sensory affordance, animals, and birds rated medium. Soil/dirt and woodchips rated high in Inquiry affordances and higher than their Sensory affordances. Art Bench also rated higher in its Sensory affordances (Table 4-LP1).

Science, Health, and Social Studies affordances perceived similarly. At Literary Park; no elements within these affordances rated high. Student Inquiry, and teaching activities that use Students' Senses/Sensory Richness affordances were also perceived and rated similarly (moderate/medium). Most biotic, and abiotic elements, built/fixed elements, and organisms rated medium across components. Teachers' comments suggested that: a) the Literary Park's strength as a gathering place with natural things to observe like plants or insects; b) they love the benches and have sat on benches and observed using 5 senses and other science units; c) the trees support Science investigations, and d) the Art Bench supported literary connections and author studies (Tables 4-LP1, 4-LP2, 4-LP3, and 4-LP4 through 4-LP6 in Appendices).

Elements commonly rated low across all curriculum/lesson activities included woodchips, and the rock with Literary Park sign. Soil/dirt, and art bench also rated low in Health affordances and this contributed to Health's lowest rating among their ITI curriculum components.

Grades 3 - 5 Teachers rated the Literary Park slightly lower in Science affordances than did grades K - 2 Teachers, based on Survey1 Question 4 responses, comparing responses of grades 3-5 teachers to responses of grades K – 2 teachers (see appendices).

Table 4-LP1. Teachers Ratings of Affordances Provided by Setting Elements for Each ITI Curriculum and Lesson Activity Component at the Literary Park

	Curriculum			Lesson Activities		
Elements on Teachers' Survey	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Trees and Shrubs	3.5	2.1	3.0	3.9	3.7	3.2
Grass	2.8	2.0	2.7	4.2	3.8	3.1
ABIOTIC - Soil / Dirt	3.2	1.7	2.3	3.9	3.6	2.9
Rock with Sign	0.0	1.0	2.0	0.0	0.0	0.0
Woodchips	2.5	1.0	1.0	*5.0*	3.0	2.5
BUILT/FIXED - Wood Benches & Rock Seating	3.3	2.9	3.5	3.7	*5.0*	3.7
Art Bench	2.0	1.7	2.0	2.0	*5.0*	2.5
ORGANISMS - Animals	2.8	2.0	2.0	3.5	2.3	2.5
Birds	3.0	2.5	2.3	3.5	3.0	2.9
Other						
Statistical Summary Mean from ANOVA analysis (4/12/13	2.67	1.78	2.33	3.44	3.33	2.71

NOTES:
Scores between 3.7 - 5.0 are rated High
Scores between 2.0 - 3.6 are rated Medium
Scores between 1.0 - 1.9 are rated Low
Italicized right justified number: rating based on 1 response

Table 4-LP2. Grouping of Setting Elements Within Each ITI Curriculum and Lesson Activity Component at Literary Park

LITERARY PARK					
	Science *#3 Rank; Medium*	**Health** *#5 Rank; Low*	**Social Studies** *#4 Rank; Medium*	**Student Inquiry** *#1 Rank; Medium*	**Sensory** *#2 rank; Medium*
High 3.7 - 5.0				**Trees & Shrubs** **Grass** **Soil / dirt** **Woodchips** **Wood Benches & Rock Seating**	**Trees & Shrubs** **Grass** **Wood Benches & Rock Seating** **Art Bench**
Medium 2.0 - 3.6	Trees & Shrubs Grass Soil / dirt Woodchips Wood Benches & Rock Seating Art Bench Animals Birds	Trees & Shrubs Grass Wood Benches & Rock Seating Animals Birds	Trees & Shrubs Grass Soil / dirt Rock with Sign Wood Benches & Rock Seating Art Bench Animals Birds	 Art Bench Animals Birds	 Soil / dirt Woodchips Animals Birds
Low 1.0 - 1.9	Rock with Sign	Soil / dirt Rock with Sign Woodchips Art Bench	Woodchips	Rock with Sign	Rock with Sign
Teachers' Comments:	Gathering place and natural things to observe i.e. plants or insects; love the benches, we have sat on benches and observed using 5 senses and other science units; trees support Science investigations.	"Open area for small groups to meet, play, plan together; a large gathering area for presentations." One said they do not use Lit Park for Health or Social Studies.	Authors *(Art Bench)* support literary connections and author studies.	Also see Science comments.	Also see Science comments.
	Note: Low, Medium, High Ratings from Table 4-LP1				

Table 4-LP3. Statistically Homogeneous Subsets of ITI Curriculum and Lesson Activity Components for Literary Park Setting (based on ANOVA analysis)

LITERARY PARK					
	Science	**Health**	**Social Studies**	**Student Inquiry**	**Student Senses / Sensory Richness**
Summary Mean	2.67^{abcde}	1.78^{abc}	2.33^{abce}	3.44^{ade}	3.33^{acde}
NOTE: Means with identical superscripts are not significantly (P < 0.05) different. ANOVA analysis, 4/12/13.					

Teachers' Perceptions at East Lawn

East Lawn setting elements rated highest by teachers. Elements rated highest in ITI affordances across curriculum/lesson activities included the open grass area and the hill and swale along the far edge. Rated slightly lower were trees and shrubs at the far edge of the lawn, the sidewalk along the edge, and soil/dirt. The next lowest rated affordances were baseball backstop and infield, and birds. Lowest rated were lights, and animals (Table 4-EL1).

Curriculum/lesson activity summary means across all East Lawn setting elements. Highest rated was for teaching activities that use Students' Senses/Sensory Richness, followed closely by Science, and then by Inquiry. Rated slightly lower/low was Health, followed by Social Studies (Table 4-EL1).

Differences in Teachers' perceptions of curriculum and lesson activity affordances at East Lawn. Statistically, teachers showed no significant differences in ratings, however, inferred homogeneous groupings, and Survey 1 Question 4 data, appeared to imply minor differences, with affordances ranked as 1) Teaching that Uses Students' Senses/Sensory Richness, 2) Science, 3) Student Inquiry, 4) Health, and 5) Social Studies. Clustering of homogeneous subsets seemed to imply subtle clusters of 1) Teaching that Uses Students' Senses/Sensory Richness, 2) Science, and 3) Student Inquiry, Health, and Social Studies. Overall, based on Table 4 data (Survey 1 Question 4 data) Social Studies affordances appeared similarly Low rated (Tables 4-EL1, 4-EL2, 4-EL3, and 4-EL4 through 4-EL6 in Appendices). Note that seven teachers commented that East Lawn was least suitable (compared to other settings) for ITI curriculum and lesson activities. They said that the large and flat area makes perimeter use a challenge for younger students.

East Lawn Sensory, Science, and Student Inquiry affordances all rated medium in affordances. Trees and shrubs at far edge of lawn, open grass, soil/dirt, and sidewalks at edge, and hill and swale at far edge, rated similarly in Science, Health, Social Studies, Inquiry, and Sensory affordances. Minor differences were that Hill and Swale rated slightly higher in Sensory and Inquiry affordances, and trees and shrubs, and open grass slightly higher in Science affordances. Highly-rated hill and swale at the far edge contributed to Sensory affordances ranking first (as well as moderately rated biotic, abiotic, and built/fixed elements, and organisms

Animals), and Student Inquiry ranking third. Birds rated moderate in Science, Low in Sensory and Health, and null in Inquiry affordances.

Teachers commented that East Lawn is used sparingly for science-related kite flying and weather science experiments. They would like diggable soil for the "Pebbles Sand and Silt FOSS (science) Kit," a water source, and better habitat for insect investigation (Tables 4-EL1 and 4-EL2).

Health affordances at East Lawn. Open grass, and sidewalk at edge rated high and the baseball backstop and infield rating medium. All other elements rated low. Two teachers commented that East Lawn is not suitable for teaching Health; others commented they use it for team building games, and that it is a great space for large motor skills and lessons with large groups (Table 4-EL1 and 4-EL2).

East Lawn's lowest ranked Social Studies affordances. No setting elements rated high, most rated medium or low. Two teachers said the setting is not suitable for Social Studies (Table 4-EL1)

Baseball Backstop and Infield, Lights, and Animals had little to no Science, Health, Social Studies, Student Inquiry affordances, and only medium Sensory affordances (Table 4-EL1).

Grades 3 - 5 Teachers rated the East Lawn slightly higher in Health, and Inquiry affordances than did grades K - 2 Teachers, based on Survey1 Question 4 responses of grades 3-5 teachers compared to responses of grades K-2 teachers (see Appendices).

Table 4-EL1. Teacher Ratings of Affordances Provided by Setting Elements for Each ITI Curriculum and Lesson Activity Component at the East Lawn

	Curriculum			Lesson Activities		
Elements on Teachers' Survey	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Trees & Shrubs at Far Edge of Lawn	**4.0**	1.5	2.0	3.5	3.1	2.8
Open Grass Area	**3.7**	**3.8**	2.6	2.7	2.8	3.1
ABIOTIC - Soil / Dirt	3.2	1.5	***3.0***	2.8	3.0	2.7
BUILT/FIXED - Sidewalk along Edge	2.7	3.0	2.0	3.5	3.0	2.8
Hill and Swale along Far Edge	3.3	1.0	***3.0***	**4.0**	**4.3**	3.1
Baseball Backstop and Infield	1.0	2.3	1.0	0.0	2.0	1.3
Lights	1.0	1.0	0.0	0.0	2.0	0.8
ORGANISMS - Animals	1.0	1.0	0.0	0.0	2.0	0.8
Birds	2.3	1.0	0	0.0	1.8	1.0
Other						
Statistical Summary Mean	**2.44**	1.89	1.56	**2.00**	**2.67**	2.11

from ANOVA analysis (4/12/13

130313 rev

NOTES:

Scores between 3.7 - 5.0 are rated High
Scores between 2.0 - 3.6 are rated Medium
Scores between 1.0 - 1.9 are rated Low
Italicized right justified number: rating based on 1 response

High
Medium
Low

Table 4-EL2. Grouping of Setting Elements Within Each ITI Curriculum and Lesson Activity Component at the East Lawn

EAST LAWN					
	SCIENCE *#2 Rank; Medium*	**HEALTH** *#4 Rank; Low*	**SOCIAL STUDIES** *#5 Rank; Low*	**STUDENT INQUIRY** *#3 Rank; Medium*	**SENSORY** *#1 Rank; Medium*
High 3.7 – 5.0	**Trees & Shrubs** **Open Grass**	**Open Grass** **Sidewalk at edge**		**Hill, swale at edge**	**Hill, swale at edge**
Medium 2.0 – 3.6	Soil / dirt Sidewalk at edge Hill, swale at edge Birds	Baseball Backstop	Trees & Shrubs Open Grass Soil / dirt Sidewalk at edge Hill, swale at edge	Trees & Shrubs Open Grass Soil / dirt Sidewalk at edge	Trees & Shrubs Open Grass Soil / dirt Sidewalk at edge Baseball Backstop Lights Animals
Low 1.0-1.9	Baseball Backstop Lights Animals	Trees & Shrubs Soil / dirt Hill, swale at edge Lights Animals Birds	Baseball Backstop Lights Animals Birds	Baseball Backstop Lights Animals Birds	Birds

Teachers' Comments	Large open flat area makes perimeter use a challenge for younger students. Not suitable (1 teacher), compared to other areas. Used little, but for flying kites & weather science experiments. Would like diggable soil, a water source, & habitat for better insect investigation (1 teacher).	Not suitable (2 teachers). Use for team building games, large motor skills lessons with large groups.	Not suitable (2 teachers).	Not suitable (1 teacher).	Not suitable (1 teacher).
	Note: Low, Medium, High Ratings from Table 1				

Table 4-EL3. Statistically Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at the East Lawn Setting (based on ANOVA analysis)

EAST LAWN					
	Science	**Health**	**Social Studies**	**Student Inquiry**	**Student Senses / Sensory Richness**
Summary Mean	2.44[a]	1.89[a]	1.56[a]	2.00[a]	2.67[a]
NOTE: Means with identical superscripts are not significantly (P < 0.05) different. ANOVA analysis, 4/12/13.					

Teachers' Perceptions at Raingarden

Raingarden setting elements rated highest by Teachers. The element rated highest across ITI affordances was Perennials-wildflowers. Setting elements rated as having medium affordances included (in order of their affordance strength) water, sand/soil/dirt, and wooden walkways, followed by trees and shrubs drain inlet and curb with stones, grass, and insects. The wood fence, birds, and amphibians rated lowest (Table 4-RG1).

Curriculum/lesson activity summary mean across all Raingarden setting elements. Highest rated was Teaching that uses Students' Senses/Sensory Richness, followed by Student Inquiry (rated high) and Science (medium). Rated lower were Social Studies. Health rated lowest. All elements rated high in Sensory and Student Inquiry affordances, except amphibians' Inquiry affordances, and Sensory affordances of water (both rated medium). For Science affordances, biotic and abiotic elements rated high. However, the drain inlet and curb with stones, and wood fence, along with insects, birds, and amphibians rated lower. Only perennials-wildflowers rated high in Social Studies affordances, with remaining elements rated moderate to low. The lowest

summary mean was for Health affordances; similar to Social Studies in that only one element rated high (Tables 4-RG1 and 4-RG2).

Student Inquiry, and Sensory affordances rated significantly higher at Raingarden. While the rating of Science (3.0) appears similar to that of Student Inquiry (3.82), they are statistically different ($p<.05$). Affordance ratings for Science cluster with those of Social Studies and Health (Tables 4-RG1 through 4-RG3, and 4-RG4 through 4-RG6 in the Appendices).

Health, and Social Studies affordances rated similarly Low at Raingarden. Only Perennials/wildflowers rated high for Social Studies, as did sand/soil/dirt for Health. The rest of the biotic, abiotic, and built elements rated moderately to low in affordances. *Social Studies* was different in that grass, the wood fence, and insects rated higher, and the drain inlet and curb with stones rated lower. Note that the Drain inlet was not responded to by teachers, nor rated regarding its Social Studies affordances. One teacher commented "Have seen mice too" (Table 4-RG2).

Lowest rated Raingarden setting elements typically included the wood fence, insects, birds, and amphibians; however, these elements all rated High in Sensory affordances. Water rated medium or high in Sensory, Inquiry, and Science affordances. However, the related drain inlet with curb and stones rated Medium in Science affordances (Tables 4-RG1, 4-RG2).

Grades 3 - 5 Teachers rated Raingarden slightly lower in Science, and Inquiry, affordances than did grades K - 2 Teachers, based on Survey1 Question 4 responses, comparing responses of grades 3-5 teachers to responses of grades K – 2 teachers (see Appendices).

Table 4-RG1. Teacher Ratings of Affordances Provided by Setting Elements for Each ITI Curriculum and Lesson Activity Component at the Raingarden

	Curriculum			Lesson Activities		
Elements on Teachers' Survey	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Water	4.0	2.8	3.5	4.2	3.6	3.6
Trees and Shrubs	4.0	2.3	2.0	4.5	4.3	3.4
Perennials / wildflowers	4.2	3.0	3.7	4.0	4.4	3.9
Grass	4.0	0.0	3.0	4.3	3.8	3.0
ABIOTIC - Sand / Soil / Dirt	4.3	4.0	2.0	3.7	3.8	3.6
BUILT/FIXED - Drain Inlet at Curb, and Stones	3.3	3.0	0.0	4.4	*5.0*	3.1
Wooden Walkways	4.0	2.0	2.3	4.0	5.0	3.5
Wood Fence	1.0	0.0	2.0	1.0	*5.0*	1.8
ORGANSIMS - Birds	1.0	0.0	0.0	4.0	4.0	1.8
Insects	3.3	0.0	3.0	4.5	4.0	3.0
Amphibians	1.0	0.0	0.0	2.5	*5.0*	1.7
Other						
Statistical Summary Mean	3.00	1.55	2.00	3.82	4.36	2.95

from ANOVA analysis (4/12/13

NOTES:
Scores between 3.7 - 5.0 are rated High
Scores between 2.0 - 3.6 are rated Medium
Scores between 1.0 - 1.9 are rated Low
Italicized right justified number: rating based on 1 response

High
Medium
Low

Table 4-RG2. Grouping of Setting Elements Within Each ITI Curriculum and Lesson Activity Component at the Raingarden

RAINGARDEN					
	SCIENCE *#3 Rank; Medium*	**HEALTH** *#5 Rank; Low*	**SOCIAL STUDIES** *#4 Rank; Medium*	**STUDENT INQUIRY** *#2 Rank; High*	**SENSORY** *#1 Rank; High*
High 3.7 – 5.0	**Water** **Trees & Shrubs** **Perennials/wildflwr** **Grass** **Sand, soil, dirt** **Wooden walkways**	**Sand, soil, dirt**	**Perennials/wildflwr**	**Water** **Trees & Shrubs** **Perennials/wildflwr** **Grass** **Sand, soil, dirt** **Drain** **Inlet/curb/stones** **Wooden walkways** **Birds** **Insects**	**Trees & Shrubs** **Perennials/wildflwr** **Grass** **Sand, soil, dirt** **Drain Inlet, curb/etc** **Wooden walkways** **Wood Fence** **Birds** **Insects** **Amphibians**
Medium 2.0 – 3.6	Drain Inlet/curb/stones Insects	Water Trees & Shrubs Perennials/wildflwrs Drain Inlet/curb/stones Wooden walkways	Water Trees & Shrubs Grass Sand, soil, dirt Wooden walkways Wood Fence Insects	Amphibians	Water
Low 1.0 – 1.9	Wood Fence Birds Amphibians	Grass Wood Fence Birds Insects Amphibians	Drain Inlet/curb/stones Birds Amphibians	Wood Fence	
	Note: Low, Medium, High Ratings from Table 1				

Table 4-RG3. Statistically Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at the Raingarden setting (based on ANOVA analysis)

RAINGARDEN					
	Science	**Health**	**Social Studies**	**Student Inquiry**	**Student Senses / Sensory Richness**
Summary Mean	3.00^{ac}	1.55^{bc}	2.00^{abc}	3.82^{d}	4.36^{d}
NOTE: Means with identical superscripts are not significantly (P < 0.05) different. ANOVA analysis, 4/12/13.					

TEACHERS' PERCEPTIONS ACROSS SETTINGS

Question 3 was: *Comparing settings, how did Teachers perceive the affordances of the three settings for teaching Science, Health, and Social Studies, and in Student Inquiry, and Sensory Richness lesson activities?*

Statistical Analysis of Teachers' Perceptions Across Settings

To help understand if and how Teachers' perceptions differed regarding the suitability of the settings' curriculum and lesson activity affordances across settings, statistical analysis of variance was done on Teachers' Survey 1 Question 4 data. Analysis (Table 4-T1) showed that:

- Raingarden is perceived as being significantly higher ($p<.05$) than Literary Park and East Lawn in its Science, Student Inquiry, and Senses/Sensory Richness affordances.
- East Lawn is perceived as having more affordances for teaching Health than Literary Park and Raingarden. Literary Park and Raingarden are not different in perceived Health affordances.
- Literary Park, East Lawn, and Raingarden are not statistically different ($p<.05$) in Social Studies affordances.

Table 4-T1. Comparison of Teachers' Perceptions of Suitability of the Three Settings for Teaching Curriculum and Lesson Activity Components at Highlands Elementary

Curriculum and Lesson Activity Component	Setting and Statistical Means			Comments
	Literary Park	East Lawn	Raingarden	
SCIENCE	2.00[a]	2.11[a]	3.63[b]	**Raingarden is different**
HEALTH	1.53[c]	2.37[d]	1.47[c]	**East Lawn is different**
SOCIAL STUDIES	1.89[e]	1.84[e]	1.74[e]	**Not different**
STUDENT INQUIRY	2.68[f]	2.37[f]	3.68[g]	**Raingarden is different**
SENSES / SENSORY RICHNESS	3.00[h]	2.47[h]	4.11[i]	**Raingarden is different**
NOTE: Teacher's Survey 1 Question 4 data. Within rows, means with identical superscripts are not significantly ($P < 0.05$) different. ANOVA analysis, Dec 12, 2012.				

Statistically analyzed summary means of teachers'-survey-elements data (Table 4-T2) showed:

- Literary Park rated highest in teaching Student Inquiry, and using Student's Senses/Sensory Richness, slightly lower for teaching Science, then lower in Social Studies affordances, and relatively unsuited for teaching activities related to Health.

- Although statistically not significant ($p<.05$), East Lawn rate slightly higher in its Science and Senses/Sensory Richness affordances, lower in its Inquiry, and Health affordances, and least suitable for Social Studies.
- A pattern emerged where teacher' rated Raingarden highest for teaching activities that employ Student Inquiry and Student's Senses/Sensory Richness, slightly lower for teaching Science, next lowest for Social Studies, and least suited for teaching Health.

Visual inspection of the means (Table 4-T2) suggests that Literary Park and Raingarden are more similar in the relative pattern of the amount/strength and grouping of curriculum and lesson activity components. East Lawn is different; analysis did not find statistical differences or subsets. When comparing affordances of curriculum and lesson activity components across settings (based on visual inspection down the columns), a pattern emerged where teachers' rated Inquiry, and Student Senses/Sensory suitability similarly high, Science rated slightly lower, followed by Social Studies, and Health affordances lowest, at both Literary Park and Raingarden. East Lawn (not statistically different across components) followed a somewhat similar pattern, but Health affordances rated slightly higher in than lowest rated Social Studies affordances.

Table 4-T2. Comparison of Each Setting's Statistical Summary Mean Rating of the Settings' ITI Curriculum and Lesson Activity Suitability

SETTING AND STATISTICAL SUMMARY MEANS (TEACHERS)					
	Science	**Health**	**Social Studies**	**Student Inquiry**	**Student Senses / Sensory Richness**
LITERARY PARK	[2.67]^{abcde}	1.78^{abc}	**[2.33]^{abce}**	(3.44)^{ade}	(3.33)^{acde}
EAST LAWN	2.44^{a}	**1.89^{a}**	1.56^{a}	2.00^{a}	2.67^{a}
RAINGARDEN	**3.00^{ac}**	1.55^{bc}	2.00^{abc}	**3.82^{d}**	**4.36^{d}**

NOTE: By row, means with identical superscripts (underlined) are not significantly ($P<0.05$) different; ANOVA analysis, 4/12/13. Components with same brackets are statistically different but similar.

Based on statistical analysis, and visual inspection of data, data clustered conceptually regarding related homogeneous subsets of ITI curriculum and lesson activity components (Table 4-T3) such that:

- Literary Park and Raingarden are similar. At both settings, there tends to be two multi-component clusters, 1 (Science, Health, and Social Studies), and 2 (Student Inquiry, and Teaching that Uses Student's Senses/Sensory Richness).

- East Lawn is different, the tendency is for two single-component (Sensory, and Science) clusters, and one multi-component cluster (Health, Social Studies, and Student Inquiry)

Table 4-T3. Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at Each Setting

LITERARY PARK		
Cluster One	**Cluster Two**	*Comments*
Science Health Social Studies	Student Inquiry Student Senses / Sensory Richness	*SCIENCE and SOCIAL STUDIES tend to agree with all other curriculum and lesson activities.*
EAST LAWN		
Cluster One	**Cluster Two**	**Cluster Three**
Sensory	Science	Health Social Studies Student Inquiry
RAINGARDEN		
Cluster One	**Cluster Two**	
Science Health Social Studies	Student Inquiry Student Senses/Sensory Richness	
NOTE: Visual Inspection, based on ANOVA analysis, 4/12/13.		

Visual Comparison of Teachers' Perceived Affordance Suitability Across Settings

"Overall" means ratings were compared (Table 4-T4) and found that:

- Raingarden rated highest, East Lawn slightly lower, and Literary Park lowest in Teachers' perceived ITI affordances across settings
- Science, Student Inquiry, and Sensory affordances rated highest in Raingarden
- Science affordances rated more similarly (low-medium) at Literary Park and East Lawn
- Health affordances rated highest at East Lawn, and lower (low rating) at Literary Park and Raingarden
- Social Studies affordances rated the same (low) across settings
- Inquiry, and Sensory, affordances rated more similarly (medium) at Literary Park and East Lawn

Table 4-T4. Visual Comparison of Each Settings' Teachers' Suitability Ratings for Teaching ITI Curriculum and Lesson Activity Components

TEACHERS OVERALL RATINGS COMPARISON	LITERARY PARK		EAST LAWN		RAINGARDEN	
	Mean Rating	Ranking	Mean Rating	Ranking	Mean Rating	Ranking
Teaching Science	1.8	Low	2	Medium	3.9	High
Teaching Health	1.4	Low	2.5	Medium	1.5	Low
Teaching Social Studies, including Geography	1.8	Low	1.8	Low	1.8	Low
Student Inquiry, from Gardner's Multiple Intelligences	2.6	Medium	2.3	Medium	3.8	High
Teaching that Uses Students' Senses / Sensory Rich	3	Medium	2.4	Medium	4.2	High

Low = 1.0 - 1.9, Medium = 2.0 - 3.6, High = 3.7 - 5.0

Note: From Teachers' Survey 1 Question 4 121217 rev 1305018

NOTE: Visual Inspection, based on Survey1 Question 4 summary data.

Contribution of Setting Elements to Evaluations of Affordance Suitability

Setting elements relating to Science affordances.

Science affordances across settings. Overall, Teachers' perceptions are statistically different; Raingarden is different than Literary Park and East Lawn; Literary Park and East Lawn are not "different." Visual inspection of the data suggests that the Raingarden rates highest, East Lawn is lower, and Literary Park slightly lower yet in Science affordances across settings. Science affordances were perceived similarly overall (non-statistically) at Literary Park and East Lawn (Table 4-T4). Science clusters similarly at Literary Park and Raingarden (with Health, and Social Studies), and on its own at East Lawn (Table 4-T3).

Literary Park. Most elements rated medium in Science affordances, except low-rated rock with Literary Park sign. Woodchips, wood benches and rock seating, art bench, and animals also rated medium; these elements are not found or were not surveyed in other settings. Teacher comments imply use of Literary Park as a Science gathering area-classroom. Animals rated medium in Literary Park, low in East Lawn, and were not surveyed at Raingarden (Table 4-T5).

East Lawn. Elements were more evenly distributed in their ratings, with trees and shrubs at the far edge, and open grass rating high. Trees and shrubs at far edge, open grass, sand/soil/dirt, and concrete sidewalk at the edge, landform topo hill and swale at the edge, and birds contributed to its medium Science rating. Compared to other settings, most of these elements are found along the setting's edge. Some teachers commented East Lawn is so large and flat that it makes its

perimeter area/edge use a challenge for young students, that they use East Lawn some for Science (flying kites, and weather-science experiments), but would like it better developed for Science by adding a water source, diggable soil, and better habitat for insect investigation (Table 4-T5).

Raingarden. Highly-rated, includes high-rated water, perennials/wildflowers, and wooden walkways (not present at other settings). High-rated trees and shrubs, and grass/open grass are present at others; only at East Lawn are these elements rated similarly high in Science. Raingarden has more biotic, abiotic elements and organisms than others. Its built features (drain inlet, wood fence) rated medium, to low, similar to the rating of built features at other settings. Birds rated lower in Science affordances at Raingarden (Table 4-T5).

Table 4-T5. Teachers: Grouping of Setting Elements; Comparison for Science Curriculum at Each Setting

Ranking-statistical-set	**Literary Park SCIENCE** *medium*	**East Lawn SCIENCE** *medium*	**Raingarden SCIENCE** *medium*
High 3.7 - 5.0		**Trees & Shrubs at Edge** **Open Grass**	**Water** **Trees & Shrubs** **Perennials/wildflowers** **Grass** **Sand, soil, dirt** **Wooden walkways**
Medium 2.0 - 3.6	Trees & Shrubs Grass Soil / dirt Woodchips Wood Benches & Rock Seating Art Bench Animals Birds	Soil / dirt Sidewalk at edge Landform Hill, swale at edge Birds	Drain Inlet/curb/stones Insects
Low 1.0 - 1.9	Rock with Sign	Baseball Backstop Lights Animals	Wood Fence Birds Amphibians
Teachers' Comments:	Gathering place and natural things to observe i.e. plants or insects; love the benches, we have sat on benches and observed using 5 senses and other science units; trees support Science investigations.	Large open flat area makes perimeter use a challenge for younger students. Not suitable (1 teacher). Used little, but for flying kites & weather science experiments. Would like diggable soil, a water source, & habitat for better insect investigation (1 teacher).	

Setting elements relating to Health affordances.

Health affordances across settings. Overall Teachers' perceptions are statistically different, East Lawn is different than Literary Park and Raingarden; Literary Park and Raingarden are not different (Table 4-T1). Visual inspection of data suggests that overall (non-statistically) East Lawn rates highest, and Literary Park and Raingarden rate low across settings (Table 4-T4). Health clusters similarly at Literary Park and Raingarden (with Science, Social Studies). At East Lawn, Health clusters differently (with Social Studies, and Student Inquiry)(Table 4-T3).

Based on statistical analysis, slightly higher/highest-rated East Lawn includes the highly-rated open grass area, and sidewalk at edge. The only other element that rated High is sand/soil/dirt in Raingarden. Other East Lawn elements mostly rated low, except for medium-rated baseball backstop and infield. Teachers commented they use East Lawn for team building games and large motor skills lessons with large groups, that it is suitable for "health activities" like team building games, large motor skills activities, and lessons with large groups. Other settings did not have large open areas that would afford such team building games activities (Table 4-T6).

Literary Park, and Raingarden. At these setting, most elements rated medium to low in Health affordances. Rated similarly medium were trees and shrubs. Wood benches and rock seating at Literary Park, and drain inlet and wooden walkways at Raingarden, rated similarly Medium; similarly low-rated were art bench at Literary Park, and wood fence at Raingarden. Animals, and birds were rated higher by teachers at Literary Park compared to Raingarden. Two teachers commented they did not use Literary Park for Health or Social Studies (Table 4-T6).

Table 4-T6. Teachers: Grouping of Setting Elements; Comparison for Health Curriculum at Each Setting

Ranking-statistical set	**Literary Park HEALTH** *low*	**East Lawn HEALTH** *low*	**Raingarden HEALTH** *low*
High 3.7 – 5.0		**Open Grass** **Sidewalk at edge**	**Sand, soil, dirt**
Medium 2.0 – 3.6	Trees & Shrubs Grass Wood Benches & Rock Seating Animals Birds	Baseball Backstop	Water Trees & Shrubs Perennials/wildflowers Drain Inlet/curb/stones Wooden walkways
Low 1.0-1.9	Soil / dirt Rock with Sign Woodchips Art Bench	Trees & Shrubs at Far Edge Soil / dirt Hill, swale at edge Lights Animals Birds	Grass Wood Fence Birds Insects Amphibians
Teachers' Comments	"Open area for small groups to meet, play, plan together; a large gathering area for presentations." One said they do not use Lit Park for Health or Social Studies.	Not suitable (2 teachers). Use for team building games, large motor skills lessons with large groups.	

Setting elements relating to Social Studies affordances.

Social Studies across settings. Overall, Teachers' perceptions of affordances across settings are not statistically different; settings are not perceived differently (Table 4-T1). Visual inspection of data suggests the three settings rated similarly low overall (non-statistically) in Social Studies affordances (Table 4-T4).

Based on comparison and categorization of each settings' statistical summary means data (teachers'-survey-elements data), Literary Park, and Raingarden, rate somewhat similarly medium in Social Studies affordances, and East Lawn rate low (Table 4-T2, Table 4-T7). Social studies clusters similarly at Literary Park and Raingarden (with Science, Health). At East Lawn, Social Studies clusters slightly differently (with Health, and Inquiry)(Table 4-T3).

Rated similarly medium across Literary Park and Raingarden. Medium rated were their biotic, abiotic, and some built elements. Birds, and amphibians rated lower. The only high-rated element in these settings was perennials/wildflowers, at Raingarden (Table 4-T7).

Seating and other "built" elements. Wood benches, rock seating, and art bench (rated medium) were found only in Literary Park. Teachers' commented that Literary Park's art bench supported literary connections and author studies. Built elements at Raingarden rated medium in Social Studies affordances included wooden walkways, and wood fence; drain inlet with curb and stones rated low (Table 4-T7).

East Lawn edge elements. Trees (evergreen) and shrubs, and hill and swale are at its far edge, and rated medium in Social Studies affordances. Two teachers commented East Lawn is not suitable for Social Studies (Table 4-T7).

Table 4-T7. Teachers: Grouping of Setting Elements; Comparison for Social Studies Curriculum at Each Setting

Ranking-statistical set	**Literary Park SOCIAL STUDIES** *medium*	**East Lawn SOCIAL STUDIES** *low*	**Raingarden SOCIAL STUDIES** *medium*
High 3.7 – 5.0			**Perennials/wildflowers**
Medium 2.0 – 3.6	Trees & Shrubs Grass Soil / dirt Rock with Sign Wood Benches & Rock Seating Art Bench Animals Birds	Trees & Shrubs at Far Edge Open Grass Soil / dirt Sidewalk at edge Hill, swale at Far edge	Water Trees & Shrubs Grass Sand, soil, dirt Wooden walkways Wood Fence Insects
Low 1.0 – 1.9	Woodchips	Baseball Backstop Lights Animals Birds	Drain Inlet/curb/stones Birds Amphibians
Teachers' Comments	Authors *(Art Bench)* support literary connections and author studies.	Not suitable (2 teachers).	

Setting elements relating to Student Inquiry affordances.

Student Inquiry across settings. Overall, teachers' perceptions are statistically different, Raingarden is "different" than Literary Park and East Lawn. Literary Park is not "different" than East Lawn, and Raingarden is not "different" than East Lawn (Table 4-T1). Visual inspection of data suggest that overall (non-statistically) Raingarden rates highest; Literary Park is lower, and East Lawn is lowest in Inquiry affordances across settings, slightly lower than Literary Park (Table 4-T4). Inquiry clusters similarly (with Sensory) at Literary Park, and Raingarden. At East Lawn, Inquiry clusters differently, with Health and Social Studies(Table 4-T3).

Literary Park. Most of this settings' biotic and abiotic elements, and wood benches and rock seating rated high in Inquiry affordances. Art bench, and animals and birds rated medium. Rock with Literary Park sign rated low (Table 4-T8).

East Lawn. Only one element rated high in Inquiry affordances, the landform hill and swale at the edge. Other elements rated medium to low; trees and shrubs at far edge, open grass, soil/dirt, and sidewalk at near edge rating medium; at other settings the same elements typically rated higher. One Teacher commented that East Lawn is not suitable for Inquiry (Table 4-T8).

Raingarden. Highest-rated setting in Student Inquiry affordances, teachers rated almost all biotic elements (water, trees and shrubs, perennials/wildflowers, grass, and abiotic sand/soil/dirt) and birds, and insects higher than in other settings. Amphibians rated medium, wood fence rated Low. Insects rated high in Raingarden; they were not surveyed in the other settings. Raingarden has more biotic, abiotic, and organisms than other settings (Table 4-T8).

Table 4-T8. Teachers: Grouping of Setting Elements; Comparison for Student Inquiry at Each Setting

Ranking-statistical set	**Literary Park STUDENT INQUIRY** *medium*	**East Lawn STUDENT INQUIRY** *medium*	**Raingarden STUDENT INQUIRY** *high*
High 3.7 – 5.0	**Trees & Shrubs** **Grass** **Soil / dirt** **Woodchips** **Wood Benches & Rock Seating**	**Hill, swale at edge**	**Water** **Trees & Shrubs** **Perennials/wildflowers** **Grass** **Sand, soil, dirt** **Drain Inlet/curb/stones** **Wooden walkways** **Birds** **Insects**
Medium 2.0 – 3.6	Art Bench Animals Birds	Trees & Shrubs Open Grass Soil / dirt Sidewalk at edge	Amphibians
Low 1.0 – 1.9	Rock with Sign	Baseball Backstop Lights Animals Birds	Wood Fence
Teachers' Comments	Also see Science comments.	Not suitable (1 teacher).	

Setting elements relating to Students' Senses/Sensory Richness affordances.

Sensory affordances across settings. Overall, Teachers' perceptions are statistically different; Raingarden is different than Literary Park and East Lawn. Raingarden rated highest, Literary Park lower, and East Lawn lowest (Table 4-T1). Visual inspection of overall (non-statistical) data shows similar findings (Table 4-T4). At Literary Park, and Raingarden, Sensory tends to cluster with Inquiry. At East Lawn, Sensory clusters on its own (Table 4-T3).

Literary Park, and Raingarden. Settings are somewhat similar; at both settings, elements clustered similarly, however, at Raingarden teachers rated all elements (except medium-rated Water) high in Sensory affordances. Soil/dirt, and birds rated lower in Literary Park, which has less/is less diverse and rich in biotic and abiotic elements and organisms compared to Raingarden. Teachers rated low in Sensory affordances the Rock with Sign in Literary Park (Table 4-T9).

East Lawn. Almost all East Lawn elements rated medium in Sensory affordances (including baseball backstop and infield, and lights at edge, built elements not present in the other

settings). Exceptions are the hill and swale at far edge (rated high) and birds, rated low (Table 4-T9).

Table 4-T9. Teachers: Grouping of Setting Elements; Comparison for Student Sensory at Each Setting

Ranking-statistical	**Literary Park SENSORY** *medium*	**East Lawn SENSORY** *medium*	**Raingarden SENSORY** *high*
High 3.7 – 5.0	**Trees & Shrubs** **Grass** **Wood Benches & Rock Seating** **Art Bench**	 **Hill, swale at far edge**	**Trees & Shrubs** **Perennials/wildflowers** **Grass** **Sand, soil, dirt** **Drain Inlet, curb edge w rocks** **Wooden walkways** **Wood Fence** **Birds** **Insects** **Amphibians**
Medium 2.0 – 3.6	Soil / dirt Woodchips Animals Birds	Trees & Shrubs at far edge Open Grass Soil / dirt Sidewalk at edge Baseball Backstop Lights Animals	Water
Low 1.0 – 1.9	Rock with Sign	Birds	
Teachers' Comments	Also see Science comments.	Not suitable (1 teacher).	

AUTHOR'S "EXPERT JUDGMENT" PERCEPTIONS AT EACH SETTING

Research Question 2 (as applied to expert judgment's perceptions) was: *At each setting, how did Expert Judgment think that the existing settings' compared in their perceived suitability, or affordances, for teaching Science, Health, Social Studies, Student Inquiry, and Sensory Rich lesson activities?*

- *which elements were found suitable, or afforded, what teaching and lesson activities?*
- *how suitable were they? (ratings: 1.0-1.9 = low; 2.0-3.6 = medium; 3.7-5.0 = high)*

Expert Judgment Perceptions at Literary Park

Literary Park setting elements rated highest by expert judgment. Elements rated highest in ITI affordances across curriculum and lesson activity components were trees and shrubs, wood benches, rock seating, and art bench, followed by woodchips. Grass, the rock with Literary Park sign, and birds rated next lowest. Lowest was soil/dirt (Table 4-LP-EJ1).

Summary Means across all Literary Park components and elements. The summary means for all curriculum and lesson activities were rated similarly low by expert judgment at Literary Park. Highest summary mean was for Student Inquiry, followed closely by Teaching that Uses Students' Senses/Sensory Richness (tied) and Science (tied). Social Studies rated next lowest, followed slightly lower by Health. No setting elements rated high; trees and shrubs, wood benches and rock seating, and art bench rated similarly highest, at medium (Tables 4-LP-EJ1, 4-LP-EJ2).

Literary Park's Health, and Social Studies affordances were perceived differently. Expert judgment rated Health, and Social Studies affordances different (lower) than others. Science, Student Inquiry, and Sensory rated very slightly higher, and clustered similarly (Table 4-LP-EJ1, 4-LP-EJ2).

Social Studies, and Health affordances. Expert judgment rated (and clustered) social studies and health affordances similarly and slightly lower. The minor differences are attributed to the rock with Literary Park Sign rating slightly higher (medium) in Inquiry affordances, birds rated

slightly higher (medium) for Science, and woodchips rated lower in Health affordances (Tables 4-LP-EJ1, 4-LP-EJ2, and Table 4-LP-EJ3 in Appendices).

Table 4-LP-EJ1. Literary Park: Expert Judgment; Rating of Setting Elements; Individual Elements and Means and Average/Mean of Curriculum and Lesson Activities

	Curriculum			Lesson Activities		
Elements on Teachers' Survey	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Trees and Shrubs	2.0	2.0	2.0	2.0	2.0	2.0
Grass	1.0	1.0	1.0	1.0	2.0	1.2
ABIOTIC - Soil / Dirt	1.0	1.0	1.0	1.0	1.0	1.0
Rock with Sign	1.0	1.0	1.0	2.0	1.0	0.0
Woodchips	2.0	1.0	2.0	2.0	2.0	1.8
BUILT/FIXED - Wood Benches & Rock Seating	2.0	2.0	2.0	3.0	2.0	2.2
Art Bench	2.0	2.0	2.0	3.0	2.0	2.2
ORGANISMS - Animals	1.0	1.0	1.0	1.0	1.0	1.0
Birds	2.0	1.0	1.0	1.0	1.0	1.2
Other						
Summary Mean	1.56	1.33	1.44	1.78	1.56	

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NOTES:
Scores between 3.7 - 5.0 are rated High
Scores between 2.0 - 3.6 are rated Medium
Scores between 1.0 - 1.9 are rated Low

High
Medium
Low

Table 4-LP-EJ2. Literary Park: Expert Judgment; Grouping of Setting Elements by Magnitude of Curriculum & Lesson Activity Affordances

	LITERARY PARK				
	Science *#2 Rank (tie); Low*	**Health** *#4 Rank; Low*	**Social Studies** *#3 Rank; Low*	**Student Inquiry** *#1 Rank; Low*	**Sensory** *#2 rank (tie); Low*
High 3.7 – 5.0					
Medium 2.0 – 3.6	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench Birds	Trees & Shrubs Wood Benches & Rock Seating Art Bench	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs Rock with Sign Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs Grass Woodchips Wood Benches & Rock Seating Art Bench
Low 1,0 – 1.9	Grass Soil/dirt Rock with Sign Animals	Grass Soil/dirt Rock with Sign Woodchips Animals Birds	Grass Soil/dirt Rock with Sign Animals Birds	Grass Soil/dirt Animals Birds	Soil/dirt Rock with Sign Animals Birds
	Note: Low, Medium, High Ratings from Table 1				

Expert Judgment Perceptions at East Lawn.

East Lawn setting elements rated highest by expert judgment. Elements rated highest in affordances across curriculum/lesson activities included the medium-rated baseball backstop and infield, and open grass area. Hill and swale along the far edge rated lower, followed lower by trees and shrubs at far edge, and lights (medium or low rated), and then low-rated soil/dirt, sidewalk along edge, animals and birds. No elements rated high at East Lawn (Table 4-EL-EJ1).

Curriculum/lesson activities summary means across settings. Expert judgment rated low all curriculum/lesson activity components across settings. The slightly higher summary mean was for Student Inquiry, followed by Health (tied), and Social Studies (tied), then Science, then Teaching that uses Students' Senses (Tables 4-EL-EJ1, 4-EL-EJ2).

East Lawn's Science and Sensory affordances were perceived differently. Expert judgment rated Science and Sensory affordances different (lower) than others. Health, Social Studies, and Student Inquiry rated very slightly higher, and clustered similarly (Table 4-EL-EJ1, 4-EL-EJ2, and Table 4-EL-EJ3 in Appendices).

Elements rated similarly medium in Social Studies, and Student Inquiry affordances. The open grass area, and hill and swale along the far edge, and baseball backstop and infield rated similarly medium in Social Studies and Student Inquiry affordances at East Lawn. Trees and shrubs at far edge rated higher (medium) in Inquiry affordances, but low in Social Studies affordances. This difference appears to have resulted in Student Inquiry rating slightly highest (Table 4-EL-EJ2).

Elements rated similarly for multiple curriculum and lesson activity components at East Lawn. Baseball backstop and infield rated medium in Science, Health, Social Studies, and Student Inquiry (for each, and on average across, curriculum and lesson activity) affordances. Open grass area rated medium in four components (Health, Social Studies, Inquiry, Sensory) and low in Science. Trees and shrubs only rated medium in Inquiry affordances (Tables 4-EL-EJ1, 4-EL-EJ2).

Table 4-EL-EJ1. East Lawn: Expert Judgment; Rating of Setting Elements; Individual Elements and Means and Average/Mean of Curriculum and Lesson Activities

	Curriculum			Lesson Activities		
Elements on Teachers' Survey	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Trees & Shrubs at Far Edge of Lawn	1.0	1.0	1.0	2.0	1.0	1.2
Open Grass Area	1.0	2.0	2.0	2.0	2.0	1.8
ABIOTIC - Soil / Dirt	1.0	1.0	1.0	1.0	1.0	1.0
BUILT/FIXED - Sidewalk along Edge	1.0	1.0	1.0	1.0	1.0	1.0
Hill and Swale along Far Edge	1.0	1.0	2.0	2.0	1.0	1.4
Baseball Backstop and Infield	2.0	3.0	2.0	2.0	1.0	2.0
Lights	2.0	1.0	1.0	1.0	1.0	1.2
ORGANISMS - Animals	1.0	1.0	1.0	1.0	1.0	1.0
Birds	1.0	1.0	1.0	1.0	1.0	1.0
Other						
Summary Mean	1.22	1.33	1.33	1.44	1.11	

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NOTES:
Scores between 3.7 - 5.0 are rated High
Scores between 2.0 - 3.6 are rated Medium
Scores between 1.0 - 1.9 are rated Low

High
Medium
Low

Table 4-EL-EJ2. East Lawn: Expert Judgment; Grouping of Setting Elements by Magnitude of Curriculum & Lesson Activity Affordances

EAST LAWN					
	SCIENCE *#3 Rank; Low*	**HEALTH** *#2 Rank (tie); Low*	**SOCIAL STUDIES** *#2 Rank (tie); Low*	**STUDENT INQUIRY** *#1 Rank; Low*	**SENSORY** *#4 Rank; Low*
High 3.7 – 5.0					
Medium 2.0 – 3.6	Baseball Backstop/Infld Lights	Open Grass Area Baseball Backstop/Infld	Open Grass Area Hill & Swale Far Edge Baseball Backstop/Infld	Trees/Shrubs Far Edge Open Grass Area Hill & Swale Far Edge Baseball Backstop/Infld	Open Grass Area
Low 1.0 – 1.9	Trees/Shrubs Far Edge Open Grass Area Soil/dirt Sidewalk along Edge Hill & Swale Far Edge Animals Birds	Trees/Shrubs Far Edge Soil/dirt Sidewalk along Edge Hill & Swale Far Edge Lights Animals Birds	Trees/Shrubs Far Edge Soil/dirt Sidewalk along Edge Lights Animals Birds	Soil/dirt Sidewalk along Edge Lights Animals Birds	Trees/Shrubs Far Edge Soil/dirt Sidewalk along Edge Hill & Swale Far Edge Baseball Backstop/Infld Animals Birds
	Note: Low, Medium, High Ratings from Table 1				

Expert Judgment Perceptions at Raingarden.

Raingarden setting elements rated highest by expert judgment. Elements rated highest in affordances across curriculum/lesson activity components were high or medium rated water, perennials/wildflowers, and trees and shrubs, followed by birds, and insects, and then drain inlet and curb with stones. Lower rated were wooden walkways, wood fence, and sand/soil/dirt. Lowest (low-rated) was grass (Table 4-RG-EJ1).

Summary means across all Raingarden components and elements. Expert judgment rated Science affordances highest (at medium); rated slightly lower (but still medium in affordances) was Student Inquiry, and Teaching that Uses Students' Senses/Sensory Richness. Raingarden's biotic elements and insects rated high in Science affordances. Health, and Social Studies rated lowest; its grass, sand/soil/dirt, wooden walkways, wood fence, and amphibians all rated low. Sand/soil/dirt rated medium in Science, and Inquiry, and low in Health, Social Studies, and Sensory affordances. Drain inlet and curb with stones rated similarly medium in Science, Social Studies, and Student Inquiry, but low in Health and Sensory affordances. Wood walkways, wood fence, and amphibians rated low in Health, and Social Studies affordances. (Tables 4-RG-EJ1, 4-RG-EJ2).

Raingarden's Science affordances were perceived differently. Expert judgment rated Science and Student Inquiry affordances different from others, clustering together. Teaching that uses Students' Senses rated and clustered on its own. Health, and Social Studies affordances also clustered conceptually (Table 4-RG-EJ1, 4-RG-EJ2, and Table 4-RG-EJ3 in Appendices).

Elements and organisms at higher-rated Raingarden. Science, Inquiry, and Sensory components rated higher at Raingarden due to the great amount and diversity of biotic (water, trees and shrubs, perennials/wildflowers rated high), abiotic (sand/soil/dirt), and built (drain inlet and curb with stones), and organisms (birds, insects)(all rated medium). Biotic elements and organisms rated medium and the rest of Raingarden's elements rated low in contrast in Health, and Social Studies affordances (Tables 4-RG-EJ1, 4-RG-EJ2).

Table 4-RG-EJ1 Raingarden: Expert Judgment; Rating of Setting Elements; Individual Elements and Means and Average/Mean of Curriculum and Lesson Activities

	Curriculum			Lesson Activities		
Elements on Teachers' Survey	Science	Health	Social Studies	Inquiry	Sensory	average
BIOTIC - Water	4.0	3.0	3.0	3.0	3.0	3.2
Trees and Shrubs	4.0	2.0	2.0	3.0	3.0	2.8
Perennials / wildflowers	4.0	3.0	3.0	3.0	3.0	3.2
Grass	1.0	1.0	1.0	1.0	1.0	1.0
ABIOTIC - Sand / Soil / Dirt	2.0	1.0	1.0	2.0	1.0	1.4
BUILT/FIXED - Drain Inlet at Curb, and Stones	3.0	1.0	2.0	3.0	1.0	2.0
Wooden Walkways	2.0	1.0	1.0	2.0	2.0	1.6
Wood Fence	2.0	1.0	1.0	2.0	2.0	1.6
ORGANISMS - Birds	2.0	2.0	2.0	2.0	2.0	2.0
Insects	3.0	2.0	2.0	3.0	3.0	2.6
Amphibians	2.0	1.0	1.0	2.0	2.0	1.6
Other						
Summary Mean	2.64	1.64	1.73	2.36	2.09	

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NOTES:

Scores between 3.7 - 5.0 are rated High — High

Scores between 2.0 - 3.6 are rated Medium — Medium

Scores between 1.0 - 1.9 are rated Low — Low

Table 4-RG-EJ2 Raingarden: Expert Judgment; Grouping of Setting Elements by Magnitude of Curriculum and Lesson Activity Affordances

RAINGARDEN					
	SCIENCE *#1 Rank; Medium*	**HEALTH** *#4 Rank (tie); Low*	**SOCIAL STUDIES** *#4 Rank (tie); Low*	**STUDENT INQUIRY** *#2 Rank; Medium*	**SENSORY** *#3 Rank; Medium*
High 3.7 – 5.0	**Water** **Trees & Shrubs** **Perennials/wildflwrs**				
Medium 2.0 – 3.6	Sand/soil/dirt Drain Inlet/Curb/stone Wooden Walkways Wood Fence Birds Insects Amphibians	Water Trees & Shrubs Perennials/wildflwrs Birds Insects	Water Trees & Shrubs Perennials/wildflwrs Drain Inlet/Curb/stone Birds Insects	Water Trees & Shrubs Perennials/wildflwrs Sand/soil/dirt Drain Inlet/Curb/stone Wooden Walkways Wood Fence Birds Insects Amphibians	Water Trees & Shrubs Perennials/wildflwrs Wooden Walkways Wood Fence Birds Insects Amphibians
Low 1.0 – 1.9	Grass	Grass Sand/soil/dirt Drain Inlet/Curb/stone Wooden Walkways Wood Fence Amphibians	Grass Sand/soil/dirt Wooden Walkways Wood Fence Amphibians	Grass	Grass Sand/soil/dirt Drain Inlet/Curb/stone
	Note: Low, Medium, High Ratings from Table 1				

AUTHOR'S "EXPERT JUDGMENT" PERCEPTIONS ACROSS SETTINGS

Question 3 was: *COMPARING SETTINGS, how does Expert Judgment perceive the affordances of the three settings for teaching Science, Health, and Social Studies, and in Student Inquiry, and Sensory Richness lesson activities?*

This section contains Expert Judgment findings based on rating the curriculum and activity component affordances of the teachers'-survey-elements in the three researched outdoor settings at Highlands Elementary school grounds.

Expert Judgment's Findings Across Settings.

Raingarden ranks highest, Literary Park is slightly lower, and East Lawn lowest in expert judgment's ITI affordance ratings (based on analysis, interpretation of setting elements in the teachers' survey) (Tables 4-EJ1, 4-EJ2).

- Raingarden is perceived as being "different" (higher suitability) than Literary Park and East Lawn, in its Science, Student Inquiry, and Senses/Sensory Richness affordances.
- Literary Park, East Lawn, and Raingarden are not perceived as being "different" in Health, and Social Studies affordances.

Table 4-EJ1. Comparison of Expert Judgment's Perceptions of the Suitability of the Three Settings for Teaching Curriculum and Lesson Activity Components at Highlands

Curriculum and Lesson Activity Component	Setting Summary Means			Comments
	Literary Park	East Lawn	Raingarden	
SCIENCE	**1.56**	**1.22**	**2.64**	**Raingarden is higher**
HEALTH	**1.33**	**1.33**	**1.64**	**Not different**
SOCIAL STUDIES	**1.44**	**1.33**	**1.73**	**Not different**
STUDENT INQUIRY	**1.78**	**1.44**	**2.36**	**Raingarden is higher**
SENSES / SENSORY RICHNESS	**1.56**	**1.11**	**2.09**	**All are slightly different. Raingarden is higher.**
NOTE: From ratings of setting elements in teachers' survey only (not setting size or design). Comments based on visual inspection. Statistical Analysis of Variance was not run on expert judgment data.				

Table 4-EJ2. Comparison of Expert Judgment's Perceptions of the Suitability, and Ranking of the Three Settings for Teaching Curriculum and Lesson Activity Components at Highlands

Setting Summary Means					
	Science	**Health**	**Social Studies**	**Student Inquiry**	**Student Senses / Sensory Richness**
LITERARY PARK	**1.56**	**1.33**	**1.44**	**1.78**	**1.56**
EAST LAWN	**1.22**	**1.33**	**1.33**	**1.44**	**1.11**
RAINGARDEN	**2.64**	**1.64**	**1.73**	**2.36**	**2.09**
	Raingarden is higher	**Not different; Raingarden is slightly higher**	**Not different; Raingarden is slightly higher**	**Raingarden is higher**	**All slightly different; Raingarden is higher**

NOTES: Based on rating of setting elements in teachers' survey only (not setting size or design). Statistical analysis of variance was not run on expert judgment data.
Low = 1.0-1.9, Medium = 2.0-3.6, High = 3.7-5.0.

Comparing elements across settings. At each setting, expert judgment calculated an average affordance strength across curriculum and lesson activities, by element (for an example see Table 4-LP-EJ1). This information is compiled in Table 4-EJ3 below. Biotic trees and shrubs and abiotic elements sand/soil/dirt tended to rate highest at Raingarden, and similarly lower at Literary Park (its woodchips) and East Lawn. Biotic water, and perennials/wildflowers (not present in other settings) rated high on average in ITI affordances at Raingarden.

Built elements (wood benches, rock seating, art bench) rated highest at Literary Park, lower at Raingarden (its drain inlet at curb with stones, wooden walkways, wood fence), and lowest at East Lawn (sidewalk at edge, landform/hill and swale at far edge, baseball backstop and infield, lights). At East Lawn, expert judgment rated baseball backstop and infield highest of all "built" elements, and at Raingarden the drain inlet and curb with stones rated highest. Organisms showed a similar affordance rating pattern, birds and insects at Raingarden rated highest on average, lower at Literary Park, and lowest at East Lawn. Animals rated similarly low at Literary Park, and East Lawn, and amphibians rated low at Raingarden (Table 4-EJ3).

Table 4-EJ3. Each Settings' Expert Judgment Average Element Rating for Teaching ITI Curriculum and Lesson Activity Components

Expert Judgment Average by Elements of Weighted Summary Rating	Literary Park	East Lawn	Raingarden
Elements on Teachers' Survey	average		
BIOTIC - Water RG			3.2
Trees and Shrubs	2.0	1.2	2.8
Perennials/wildflowers RG			3.2
Grass	1.2	1.8	1.0
ABIOTIC - Soil / Dirt	1.0	1.0	1.4
Rock with Sign LP	0.0		
Woodchips LP	1.8		
BUILT/FIXED - Wood Benches & Rock Seating LP	2.2		
Art Bench LP	2.2		
Sidewalk along Edge EL		1.0	
Hill and Swale along Far Edge EL		1.4	
Baseball Backstop and Infield EL		2.0	
Lights EL		1.2	
Drain Inlet at Curb with Stones RG			2.0
Wooden Walkways RG			1.6
Wood Fence RG			1.6
ORGANISMS - Animals	1.0	1.0	
Birds	1.2	1.0	2.0
Insects RG			2.6
Amphibians RG			1.6
Other			
NOTES:			
Ranking color code =	X.X	X.X	X.X
Relative Ranking of non-similar elements based on visual inspection	Lowest	In Middle	Highest

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NOTE: Based on data from elements included in the teachers' survey. Relative ranking and color coding applies by element type across settings only.

Based on visual inspection of data in Tables 4-EJ1 and 4-EJ2, patterns emerged that implied the clustering of curriculum and lesson activity components affordances. At Literary Park, and East Lawn the tendency is for two similar clusters; however, Inquiry clustered with Science and Sensory at Literary Park, whereas it clustered with Health and Social Studies at East Lawn. Raingarden is different, its tendency is for three clusters (Science, Student Inquiry cluster), Sensory on its own, and Social Studies and Health clustering together (Table 4-EJ4).

Table 4-EJ4. Expert Judgment; Comparison of Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components

LITERARY PARK		
Cluster One	**Cluster Two**	
Science	Health	
Inquiry	Social Studies	
Sensory		
EAST LAWN		
Cluster One	**Cluster Two**	
Science	Health	
Sensory	Social Studies	
	Inquiry	
RAINGARDEN		
Cluster One	**Cluster Two**	**Cluster Three**
Science	Health	Sensory
Inquiry	Social Studies	

NOTE: Based on Visual Inspection of Tables 4-EJ1 and 4-EJ2 summary means data.

Contribution of Setting Elements to Expert Judgment Evaluation of Affordance Suitability

Setting elements related to Science affordances

Science affordance across settings. Expert judgment perceived the Science affordances of Raingarden (medium rated) differently than Literary Park, and East Lawn. Raingarden rates and ranks highest, Literary Park is lower, and East Lawn is lowest. Literary Park and East Lawn are not very "different;" Literary Park rates and ranks slightly higher than East Lawn (Tables 4-EJ1 and 4-EJ2).

Similarity in clustering of curriculum/lesson activity components. Science tends to cluster similarly across settings, with Inquiry or Sensory (with Inquiry at Raingarden, Sensory at East Lawn, and Inquiry and Sensory at Literary Park) (Table 4-EJ4).

Literary Park, and East Lawn. About one-half of Literary Park's elements rated medium for Science, whereas most elements rated low at East Lawn. Literary Park's trees and shrubs, wood benches and rock seating, art bench, and birds rated Medium; similar elements rated low at East Lawn. Note, benches were not present in East Lawn, and grass, soil/dirt, and animals rated low.

Expert Judgment rated medium in Science affordances the East Lawn's baseball backstop and infield, and lights. (Evergreen) trees and shrubs at far edge, concrete sidewalk at edge, and landform hill and swale at far edge rated low due to their distance from the school building and small amount of elements, most of which are found along the setting's edge, in contrast to the other settings (Table 4-EJ5).

Raingarden. Highest rated in Science affordances, Raingarden includes highly-rated biotic water, trees and shrubs, and perennials/wildflowers. Trees and shrubs are present at other settings, but rated lower (medium at Literary Park, low at East Lawn). Raingarden had more biotic and abiotic elements, and organisms than other settings. Raingarden's other elements rated medium in Science affordances except for low-rated Grass **(**Table 4-EJ5).

Science affordances of "populations" (individuals, groups, entire class). Expert judgment's ratings varied; Literary Park rated highest due to its size, and having many bench and seating elements, Raingarden lower (smaller size with some built elements but not seating), and East Lawn lowest (large open area but no seating) (setting data spreadsheets in Appendices, and Table 4-EJ5).

Table 4-EJ5. Expert Judgment: Grouping of Setting Elements; Comparison for Science Curriculum at Each Setting

Ranking	**Literary Park SCIENCE** *low*	**East Lawn SCIENCE** *low*	**Raingarden SCIENCE** *medium*
High 3.7 - 5.0			**Water** **Trees & Shrubs** **Perennials/wildflowers**
Medium 2.0 - 3.6	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench Birds	Baseball Backstop/Infld Lights	Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 - 1.9	Grass Soil / dirt Rock with Sign Animals	Trees & Shrubs at Far Edge Open Grass Area Soil / dirt Sidewalk at edge Landform Hill, swale at far edge Animals Birds	Grass
Low, medium, high rankings from summary means, Teacher's Survey elements in data tables			

Setting Elements Related to Health Affordances

Health affordances across settings. Expert judgment perceived the three setting as similar, however, Raingarden rated very slightly higher in Health affordances (Tables 4-EJ1, 4-EJ2).

Similarity in clustering of curriculum/lesson activity components. Health clusters similarly across settings, with Social Studies, and also with Inquiry at East Lawn (Table 4-EJ4).

Literary Park and Raingarden. Biotic Trees and shrubs, and built benches rated similarly Medium in Health affordances; at East Lawn these rated Low (Table 4-EJ6).

East Lawn. The highest rated elements were the open grass area, and baseball backstop and infield. Note that other settings did not have such predominantly large open areas (Table 4-EJ6).

Health affordances of "populations" (individuals, groups, entire class). Affordances varied slightly; East Lawn's large open area and Baseball backstop and infield afforded multiple activities, and group and team sports. Literary Park's benches and seating afford gathering and classroom activities. Raingarden was perceived slightly higher due to its mix of biotic, abiotic, built (but not seating) elements, and organisms in a small space, affording health curriculum for individuals, pairs, and small groups centered on water, native plants and associated organisms (setting data spreadsheets in Appendices, and 4-EJ6).

Table 4-EJ6. Expert Judgment; Grouping of Setting Elements; Comparison for Health Curriculum at Each Setting

Ranking	**Literary Park HEALTH** *low*	**East Lawn HEALTH** *low*	**Raingarden HEALTH** *low*
High 3.7 – 5.0			
Medium 2.0 – 3.6	Trees & Shrubs Wood Benches & Rock Seating Art Bench	Open Grass Area Baseball Backstop/Infld	Water Trees & Shrubs Perennials/wildflowers Birds Insects
Low 1.0-1.9	Grass Soil / dirt Rock with Sign Woodchips Animals Birds	Trees & Shrubs at Far Edge Soil / dirt Sidewalk at edge Hill, swale at Far edge Lights Animals Birds	Grass Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Amphibians
Low, medium, high rankings from summary means, Teacher's Survey elements in data tables			

Setting Elements Related to Social Studies.

Social Studies affordances across settings. Expert Judgment perceived the three settings as similar, however, Raingarden rated very slightly higher, followed very slightly lower by Literary Park and then East Lawn (Tables 4-EJ1 and 4-EJ2).

Similarity in clustering of curriculum/lesson activity components. Social Studies clusters similarly across settings, usually with Health, also with Inquiry at East Lawn (Table 4-EJ4).

Rating of elements across settings. Settings were similar in that no elements rated high in Social Studies affordances. Trees and shrubs rated similarly medium at Literary Park and Raingarden; at East Lawn they rated low (due to [evergreen] trees and shrubs being at the edge). Open/grass rated slightly higher at East Lawn than at other settings. Literary Park's wood benches, rock seating, and art bench, and East Lawn's baseball backstop and infield rated slightly higher as built elements, than at other settings. Raingarden's built elements (except drain inlet and curb with stones) rated slightly lower in Social Studies affordances. Note that built seating (wood benches, rock Seating, art bench) were found in Literary Park, but not East Lawn or Raingarden (Table 4-EJ7).

Raingarden. Its organisms rated slightly higher in Social Studies affordances than at other settings. Expert judgment also noted (and informally "rated") the view of the pond below Raingarden as medium in Social Studies affordances (Table 4-EJ7).

Social Studies affordances of "populations" (individuals, groups, entire class). Literary Park rated very slightly higher in its populations affordances for Social Studies compared to other settings; its woodchips, wood benches, rock seating, and art bench afford this slightly higher affordance rating for individuals, pairs, groups, and classes (setting data spreadsheets in Appendices, and Table 4-EJ7).

Table 4-EJ7. Expert Judgment; Grouping of Setting Elements; Comparison for Social Studies Curriculum at Each Setting

Ranking	**Literary Park SOCIAL STUDIES** *low*	**East Lawn SOCIAL STUDIES** *low*	**Raingarden SOCIAL STUDIES** *low*
High 3.7 – 5.0			
Medium 2.0 – 3.6	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench	Open Grass Area Hill, swale at Far edge Baseball Backstop/Infld	Water Trees & Shrubs Perennials/wildflowers Drain Inlet/curb/stones Birds Insects
Low 1.0 – 1.9	Grass Soil / dirt Rock with Sign Animals Birds	Trees & Shrubs at Far Edge Soil / dirt Sidewalk at edge Lights Animals Birds	Grass Sand, soil, dirt Wooden walkways Wood Fence Amphibians
Low, medium, high rankings from summary means, Teacher's Survey elements in data tables			

Setting Elements Related to Student Inquiry.

Student Inquiry affordances across settings. Expert judgment perceived Raingarden (rated medium) as different, and higher, than Literary Park and East Lawn (both rated low) in Inquiry affordances. Literary Park and East Lawn are not very "different;" Literary Park rates slightly higher (Tables 4-EJ1 and 4-EJ2).

Similarly in clustering of curriculum/lesson activity components. Student Inquiry tends to cluster similarly at Literary Park, and Raingarden; with Science, and also with Sensory at Raingarden. At East Lawn, Inquiry clusters with Health, and Social Studies (Table 4-EJ4).

Similarity in ratings of Inquiry affordances across settings. The most elements rated medium in Inquiry affordances where at Raingarden (except grass, rated low, and insects, rated high). Soil/dirt, and animal and birds rated similarly lower at Literary Park and East Lawn. Note that Raingarden has more biotic and abiotic elements and organisms than other settings (Table 4-EJ8).

Student Inquiry affordances of "populations" (individuals, groups, entire class). Expert judgment perceived Inquiry affordances for populations similarly in Literary Park and Raingarden (medium to high), and slightly lower in East Lawn, due to its low amount of biotic and abiotic elements and organisms, and the distance to elements at its edge (setting data spreadsheets in Appendices, and Table 4-EJ8).

Table 4-EJ8. Expert Judgment: Grouping of Setting Elements; Comparison for Student Inquiry at Each Setting

Ranking	**Literary Park STUDENT INQUIRY** *low*	**East Lawn STUDENT INQUIRY** *low*	**Raingarden STUDENT INQUIRY** *medium*
High 3.7 – 5.0			
Medium 2.0 – 3.6	Trees & Shrubs Rock with Sign Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs at Far edge Open Grass Area Hill, swale at Far edge Baseball Backstop/Infld	Water Trees & Shrubs Perennials/wildflowers Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 – 1.9	Grass Soil / dirt Animals Birds	Soil / dirt Sidewalk at edge Lights Animals Birds	Grass
Low, medium, high rankings from summary means, Teacher's Survey elements in data tables			

Setting Elements Related to Students' Senses/Sensory Richness

Student Senses/Sensory affordances across settings. Expert judgment perceived the teaching that uses Student's Senses/Sensory Richness affordances of the settings as different;

Raingarden (medium-rated) rated highest, Literary Park lower, and East Lawn lowest (Tables 4-EJ1, 4-EJ2).

Clustering of curriculum/lesson activity components. Sensory affordances tend to be different at Raingarden; they "cluster" conceptually on their own, whereas they cluster with Inquiry and Science at Literary Park, and with Science at East Lawn (Table 4-EJ4).

Similarity in Rating of Student Senses/Sensory Richness. At Raingarden, expert judgment rated most biotic and built elements and organisms medium in Sensory affordances (except low-rated grass, sand/soil/dirt, drain inlet with curb and stones). Drain inlet rated lower due to its interaction with water, an intermittent element. In comparison, almost all elements at East Lawn rated low in sensory affordances, except for open grass area (rated medium)(also rated medium at Literary Park). At Literary Park, most biotic and built elements rated similarly to Raingarden (medium rated), but organisms (animals, birds) rated lower. Note that Raingarden has more biotic and abiotic elements and organisms than other settings (Table 4-EJ9).

Sensory affordances of "populations" (individuals, groups, entire class). Expert judgment's perceived sensory affordances for populations varied among settings. Raingarden rated highest due to its richer design and amount and diversity of elements, including some built elements like wooden walkways, drain inlet with curb and stones (affording gathering and learning/inquiry as individuals and small groups). Literary Park rated lower, and East Lawn lowest (Table 4-EJ9).

Table 4-EJ9. Expert Judgment: Grouping of Setting Elements; Comparison of Student Senses/Sensory, Each Setting

Ranking	**Literary Park SENSORY** *low*	**East Lawn SENSORY** *low*	**Raingarden SENSORY** *medium*
High 3.7 – 5.0			
Medium 2.0 – 3.6	Trees & Shrubs Grass Woodchips Wood Benches & Rock Seating Art Bench	Open Grass Area	Water Trees & Shrubs Perennials/wildflowers Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 – 1.9	Soil / dirt Rock with Sign Animals Birds	Trees & Shrubs at Far edge Soil / dirt Sidewalk at edge Hill, swale at Far edge Baseball Backstop Lights Animals Birds	Grass Sand, soil, dirt Drain Inlet/curb edge/stones
Low, medium, high rankings from summary means, Teacher's Survey elements in data tables			

COMPARISON OF PERCEPTIONS OF TEACHERS, AND EXPERT JUDGMENT, ACROSS SETTINGS

Research Questions 4, 5, are closely inter-related and are addressed together in this chapter. "Question 6" is addressed as "discussion" in Chapter 5.

Research Question 4 was: *How do teachers' and expert judgment's perceptions of affordance presence and suitability vary across settings? How are teachers' and expert judgment's perceptions different across settings, and what kinds of patterns exist in perceptions across settings?*

Research Question 5 was: *If so, why are the teachers' perceptions of affordance suitability "different" than the "expert judged" (or actual) presence or perception of affordances?*

This chapter compares ratings by Teachers, and Expert Judgment, of ITI Curriculum and Lesson Activity Affordances *Across* Settings, based on data rated and analyzed for each element in the teachers' survey. Teachers also added comments in the teachers survey, these are included in the analysis and comparison of perceptions, along with observations and analysis by expert judgment regarding some significant settings' elements not included in the teachers survey, but included in and rated in expert judgment's settings data spreadsheets (see Appendices).

Comparison of Teachers', and Expert Judgment's, ITI Curriculum and Lesson Activity Affordance Perceptions Across Settings

Comparing perceived "differences" (statistically significant, and without statistical analysis). Based on summary means ratings of elements only included in the teachers' survey (Table 4-T/EJ1).

Teachers' summary means were higher. Teachers usually rated higher (than expert judgment) the summary means for the same curriculum and lesson activity components across settings. This reflects/implies that expert judgment tended to rate elements, and curriculum and lesson activity components, more conservatively (Table 4-T/EJ1).

Similar patterns perceived in the ITI affordances for Science, Student Inquiry, and Students Senses/Sensory Richness. Teachers and Expert Judgment perceived similar patterns in affordance suitability across settings; both rated Raingarden highest, Literary Park in the middle, and East Lawn lowest in curriculum and lesson activity affordance suitability across settings. Perceptions were slightly different for Health, and Social Studies affordances across settings (Table 4-T/EJ1).

Teachers appeared to perceive Health affordances across settings slightly differently than Expert Judgment; Teachers rated East Lawn slightly highest, whereas expert judgment rated Raingarden slightly highest. Teachers commented they find East Lawn suitable for and used for team building games, and large motor skills lessons and activities with large groups. Expert judgment rated Raingarden's biotic and abiotic elements higher in Health affordances (implying,

for example, Health curriculum affordances in Food for Health & Fitness, Being & Keeping Safe, Staying Fit & Healthy curriculum sub-strands) (Table 4-T/EJ1).

Teachers appeared to perceive Social Studies affordances across settings differently than Expert Judgment; Teachers rated Literary Park highest, this reflects the classroom and gathering area affordances of its built elements like benches and Art Bench. Expert Judgment rated Raingarden slightly higher in Social Studies affordances; some biotic and abiotic elements rated higher, this reflects expert judgment's rating of Social Studies affordances based on Raingarden being a man-made "garden" setting, having been designed and built purposefully with environmental, social, economic and educational purposes and functions at its core. Both teachers and expert judgment rated East Lawn similarly lowest (low ratings) in Social Studies affordances (Table 4-T/EJ1).

By Setting Comparison of Teachers', and Expert Judgment's ITI Affordance Perceptions Across Curriculum/Lesson Activity Components

Literary Park. Across curriculum and lesson activity components, teachers rated each component's suitability slightly differently (low to medium), whereas expert judgment rated suitability relatively the same (low) across components (Table 4-T/EJ1).

East Lawn. Across curriculum and lesson activity components, both teachers and expert judgment rated components suitability about the same (not different statistically or based on expert judgment's visual inspection). Teachers rated East Lawn low to medium on average across components, whereas expert judgment rated it low (Table 4-T/EJ1).

Raingarden. Across curriculum and lesson activity components, teachers rated Social Studies, Student Inquiry, and Sensory components higher (high or medium ratings) than expert judgment Teachers and expert judgment rated Science, and Health affordances about the same (medium or low ratings). However, at Raingarden, expert judgment rated its Health affordances slightly higher than teachers (the only setting where expert judgment rated a component higher, but very slightly only). Teachers rated Raingarden medium to high on average across components, whereas expert judgment rated the setting medium on average across components. (Table 4-T/EJ1).

Table 4-T/EJ1. Teachers and Expert Judgment; Comparison of ITI Curriculum and Lesson Activity Affordance Ratings *Across* Settings

	Curriculum and Lesson Activity Components									
	Science		Health		Social Studies		Student Inquiry		Student Senses - Sensory Richness	
Setting	T	EJ	T	EJ	T	EJ	T	EJ	T	EJ
Literary Park	2.67 abcde	1.56	1.78 abc	1.33	2.33 abce	1.44	3.44 ade	1.78	3.33 acde	1.56
East Lawn	2.44 a	1.22	1.89 a	1.33	1.56 a	1.33	2.00 a	1.44	2.67 a	1.11
Rain-garden	3.00 ac	2.64	1.55 bc	1.64	2.00 abc	1.73	**3.82** d	2.36	**4.36** d	2.09

Numbers are each setting summary means (teachers (T) are statistical/ANOVA. Expert judgment (EJ) are non-ANOVA), from setting elements in teachers' survey only. ANOVA Analysis of teachers' (T) data, 4/12/13. Within rows, means with identical superscripts are not significantly (P<0.05) different. Low = 1.0-1.9, Medium = 2.0-3.6, High = **3.7-5.0.**

Comparison of Teachers' and Expert Judgment's Perceptions of Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components

Teachers' and Expert Judgment's clusters at Literary Park. Subsets clustered similarly, both teachers and expert judgment conceptually-patterned two clusters of similar curriculum and lesson activity components. Science clusters differently; teachers cluster Science with Health and Social Studies, while expert judgment clustered Science with Inquiry and Sensory affordances. This implies teachers' greater perceived classroom/gathering area Science-Health-Social Studies affordances of Literary Park elements, and expert judgment's greater perceived Science-Inquiry-Sensory affordances of biotic and abiotic elements and organisms at Literary Park (Table 4-T/EJ2).

Teachers' and Expert Judgment's clusters at East Lawn. Both teachers, and expert judgment, pattern three clusters; they are different in that teachers' cluster Science, and Sensory affordances separately, and expert judgment clusters Science, and Sensory together at East Lawn. This may imply that teachers perceive little to no Sensory affordances in East Lawn's elements, and of elements that do have such affordances (for example, trees [evergreen] and shrubs, Hill and swale), located at settings' edge, are too far away for use by younger students. In combination with teachers' comments, this also implies Teachers perceived affordance suitability of East

Lawn as an open area/stage-like place for teaching Science and conducting weather-related science activities. Expert judgment's clustering of Science, and Sensory, similarly reflects low affordances for Science, and Sensory, but suggests an affordance synthesis for them, especially for the settings' edge elements (Table 4-T/EJ2).

Teachers' and Expert Judgment's clusters at Raingarden. Teachers cluster Science with Health, and Social Studies, whereas, expert judgment clusters Science with Inquiry. Teachers cluster Sensory with Inquiry, while expert judgment clusters Sensory separately (on its own). This likely reflects Teachers' perceptions of the small gathering area Science-Health-Social Studies affordances of Raingarden's built elements (wooden walkways, drain inlet with curb and stones, in combination with the settings biotic and abiotic elements and organisms), and Expert Judgment's perceptions of high Sensory (and Science, and Inquiry) affordances due to the number and diversity of biotic and abiotic elements and organisms there (especially Perennials/wildflowers, birds and insects and their interrelated ecological associations) (Table 4-T/EJ2).

Table 4-T/EJ2. Teachers and Expert Judgment; Comparison of Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components

LITERARY PARK					
Cluster One		**Cluster Two**		**Cluster Three**	
T	EJ	T	EJ	T	EJ
Inquiry	**Inquiry**	**Health**	**Health**		
	Science	**Social Studies**	**Social Studies**		
Sensory	**Sensory**	Science			
Inquiry, Sensory similar		**Health, Social Studies similar**			
Science clustering perceived differently					
EAST LAWN					
Cluster One		**Cluster Two**		**Cluster Three**	
T	EJ	T	EJ	T	EJ
Inquiry	**Inquiry**	Science	**Science**		
Health	**Health**		Sensory	Sensory	
Social Studies	**Social Studies**				
Inquiry, Health, Social Studies similar		**Science similar**			
Science, and Sensory clustering perceived different					
RAINGARDEN					
Cluster One		**Cluster Two**		**Cluster Three**	
T	EJ	T	EJ	T	EJ
	Science	**Health**	**Health**		Sensory
Sensory		Science			
Inquiry	**Inquiry**	**Social Studies**	**Social Studies**		
Inquiry similar		**Health, Social Studies similar**			
Science, Sensory clustering perceived different					

Based on Visual Inspection of Tables of Summary Means data; Teachers' Survey elements

Comparison of Teachers' and Expert Judgment's Perceptions Relating to the Effects of Setting Elements for Each ITI Curriculum Component

Comparison of Teachers' and Expert Judgment's Grouping of Setting Elements Across Settings Related to Science Affordances.

Comparing the ratings-rankings of each setting's summary means. Teachers rated each settings Science affordances higher than the Expert Judgment, except at Raingarden, where the

rating-ranking (medium) was the same. In general, this difference can be attributed to expert judgment rating elements' affordances more conservatively than teachers (Table 4-T/EJ-Sci)..

Literary Park. Teachers rated Literary Park different than expert judgment, rating it medium compared to expert judgment's low rating for Science affordances. Differences were minor; teachers rated grass, and soil/dirt, and animals higher than expert judgment. Teachers commented they used it as a gathering place (implying affordances for "populations"), that there were natural things to observe (plants, insects), that they had used the benches for observing using 5 senses and other science units, and that trees support Science investigations (Table 4-T/EJ-Sci).

East Lawn. Teachers rated-ranked Science affordances higher at East Lawn; they rated "edge" (evergreen) trees and shrubs, and the open grass area higher, but commented that the "large open flat area makes perimeter use a challenge for younger students". One teacher said East Lawn is not suitable for teaching Science, others said they used it little, except for flying kites and weather science experiments, and that they would like diggable soil, a water source, and habitat for better insect investigation. This implies perceived strength by teachers in affordances of edge elements for older students, and for the open grass as a platform/stage for science teaching and weather related/other science experiments. Expert judgment rated higher and perceives Science affordances in the Baseball backstop and infield, and Lights, implying affordances related to Nature of Science and Engineering curriculum strands and sub-strands (Table 4-T/EJ-Sci).

Raingarden. The ratings-rankings were similar, however, teachers rated more elements both high and low, compared to expert judgment. Most Raingarden elements were rated high or medium in Science affordances by expert judgment (Table 4-T/EJ-Sci).

Table 4-T/EJ-Sci. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Science Curriculum at Each Setting

Rating-Ranking	Literary Park SCIENCE		East Lawn SCIENCE		Raingarden SCIENCE	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *Medium*
High 3.7 - 5.0			**Trees & Shrubs at Far Edge** **Open Grass Area**		**Water** **Trees & Shrubs** **Perennials-wildflowers** **Grass** **Sand, soil, dirt** **Wooden walkways**	**Water** **Trees & Shrubs** **Perennials-wildflowers**
Medium 2.0 - 3.6	Trees & Shrubs Grass Soil / dirt Woodchips Wood Benches & Rock Seating Art Bench Animals Birds	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench Birds	Soil / dirt Sidewalk at edge Landform Hill, swale at far edge Birds	Baseball Backstop/Infld Lights	Drain Inlet/curb/stones Insects	Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 - 1.9	Rock with Sign	Grass Soil / dirt Rock with Sign Animals	Baseball Backstop/Infld Lights Animals	Trees & Shrubs at Far Edge Open Grass Area Soil / dirt Sidewalk at edge Landform Hill, swale at far edge Animals Birds	Wood Fence Birds Amphibians	Grass
Teachers' Comments	Gathering place, natural things to observe i.e. plants, insects; love the benches, have sat on benches, observed using 5 senses, other science units; trees support Science investigations.		Large open flat area makes perimeter use a challenge for younger students. Not suitable (1 teacher) compared to others. Used little, but for flying kites, weather science experiments. Would like diggable soil, water source, habitat for better insect investigation (1 teacher).			
Low, medium, high rankings based on summary means, Teachers' Survey elements in data tables						

Comparison of Teachers' and Expert Judgment's Perceptions Grouping of Setting Elements Across Settings Related to Health Affordances

Comparing the ratings-rankings of each setting's summary means. Teachers and expert judgment rated Health affordances similarly low across all settings. Teachers rated East Lawn's Health affordances slightly differently than expert judgment, as further discussed below (Table 4-T/EJ-Hlt).

Literary Park. Minor differences were that Teachers rated open grass area, and animals, and birds, higher than expert judgment. This is likely a result of expert judgment rating elements lower/more conservatively than teachers (Table 4-T/EJ-Hlt).

East Lawn. A minor difference in Science ratings is that expert judgment also rated the open grass area, and sidewalk at edge, lower/more conservatively than Teachers (Table 4-T/EJ-Hlt).

Raingarden. Minor differences were teachers rating higher the drain inlet, and wooden walkways, and expert judgment rated higher the organisms birds, and insects. This implies that Teachers perceived the drain inlet, and wooden walkways as rating higher as a gathering area/outdoor classroom, and expert judgment perceived the biotic and abiotic elements, and organisms, working together regarding Health affordances in a slightly different way (related to curriculum strand such as "Being and Keeping Safe" and its "avoidance of threatening situations, safe play, and potential outdoor hazards" benchmarks (Table 4-T/EJ-Hlt).

Table 4-T/EJ-Hlt. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Health Curriculum at Each Setting

Rating-Ranking	Literary Park HEALTH		East Lawn HEALTH		Raingarden HEALTH	
	Teachers *low*	**Expert Judg** *low*	**Teachers** *low*	**Expert Judg** *low*	**Teachers** *low*	**Expert Judg** *Low*
High 3.7 - 5.0			Open Grass Area Sidewalk at edge		Sand, soil, dirt	
Medium 2.0 - 3.6	Trees & Shrubs Grass Wood Benches & Rock Seating Animals Birds	Trees & Shrubs Wood Benches & Rock Seating Art Bench	Baseball Backstop-Infld	Open Grass Area Baseball Backstop/Infld	Water Trees & Shrubs Perennials-wildflowers Drain Inlet/curb/stones Wooden walkways	Water Trees & Shrubs Perennials-wildflowers Birds Insects
Low 1.0 - 1.9	Soil / dirt Rock with Sign Woodchips Art Bench	Grass Soil / dirt Rock with Sign Woodchips Animals Birds	Trees & Shrubs at Far Edge Soil / dirt Hill, swale at Far edge Lights Animals Birds	Trees & Shrubs at Far Edge Soil / dirt Sidewalk at edge Hill, swale at Far edge Lights Animals Birds	Grass Wood Fence Birds Insects Amphibians	Grass Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Amphibians
Teachers' Comments	"Open area for small groups to meet, play, plan together; a large gathering area for presentations." One said do not use for Health or Social Studies.		Not suitable (2 teachers). Use for team building games, large motor skills lessons with large groups.			
Low, medium, high rankings based on summary means, Teachers' Survey elements in data tables						

Comparison of Teachers' and Expert Judgment's Grouping of Setting Elements Across Settings Related to Social Studies Affordances

Comparing the ratings-rankings of each setting's summary means. Teachers and Expert Judgment rated the East Lawn similarly low in Social Studies affordances, whereas teachers rated Literary Park, and Raingarden, slightly higher in affordances (Table 4-T/EJ-Soc).

Literary Park. Minor differences were that expert judgment rated more conservatively, and lower, its grass, soil/dirt, rock with sign, and animals and birds in Social Studies affordances (Table 4-T/EJ-Soc).

East Lawn. Minor differences were that expert judgment rated the baseball backstop and infield higher in Social Studies, whereas teachers' rated [evergreen] trees and shrubs at the far edge, soil/dirt, and the sidewalk at edge higher. Two teachers commented that East Lawn is "not suitable" for teaching Social Studies. Expert Judgment perceived higher "social" affordances, especially for "population" groups and classes, at the baseball backstop and infield. Even though trees and shrubs were at the far edge, some teachers' rated them higher in Social Studies affordances. Teachers also appeared to perceive the sidewalk at (near) edge potentially as a part of the flat grassy open area, part of the large "stage" for teaching Social Studies (Table 4-T/EJ-Soc).

Raingarden. Minor differences were that teachers rated higher perennials-wildflowers, grass, sand/soil/dirt, wooden walkways, and wood fence; expert judgment rated higher the drain inlet with curb and stones, and birds and insects. Teachers may have rated such built elements like the wooden walkways, and fence, slightly higher due to their gathering/use for small groups and classroom population's affordances; expert judgment perceived a combination of elements as affording the Raingarden's social affordances as a man-made purposefully built "garden" with social, educational, and environmental functions (Table 4-T/EJ-Soc).

Table 4-T/EJ-Soc. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Social Studies Curriculum at Each Setting

Rating-Ranking	Literary Park SOCIAL STUDIES		East Lawn SOCIAL STUDIES		Raingarden SOCIAL STUDIES	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *low*	**Expert Judg** *Low*	**Teachers** *medium*	**Expert Judg** *Low*
High 3.7 - 5.0					Perennials-wildflowers	
Medium 2.0 - 3.6	Trees & Shrubs Grass Rock with Soil / dirt Sign Wood Benches & Rock Seating Art Bench Animals Birds	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs at Far Edge Open Grass Area Soil / dirt Sidewalk at edge Hill, swale at Far edge	Open Grass Area Hill, swale at Far edge Baseball Backstop/Infld	Water Trees & Shrubs Grass Sand, soil, dirt Wooden walkways Wood Fence Insects	Water Trees & Shrubs Perennials-wildflowers Drain Inlet/curb/stones Birds Insects
Low 1.0 - 1.9	Woodchips	Grass Soil / dirt Rock with Sign Animals Birds	Baseball Backstop/Infld Lights Animals Birds	Trees & Shrubs at Far Edge Soil / dirt Sidewalk at edge Lights Animals Birds	Drain Inlet/curb/stones Birds Amphibians	Grass Sand, soil, dirt Wooden walkways Wood Fence Amphibians
Teachers' Comments	Authors (Art Bench) support literary connections, author studies.		Not suitable (2 teachers).			
Low, medium, high rankings based on summary means, Teachers' Survey elements in data tables						

Comparison of Teachers' and Expert Judgment's Grouping of Setting Elements Across Settings Related to Student Inquiry.

Comparing the ratings-rankings of each setting's summary means. Teachers and expert judgment rated the settings differently in Student Inquiry affordances. Teachers rated affordances higher (especially at Raingarden, Literary Park) than expert judgment; this difference may be attributed to expert judgment rating elements more conservatively (Table 4-T/EJ-Inq).

Literary Park, and Raingarden. Teachers rated higher the affordances of most elements. A minor difference was at Raingarden, where teachers rated higher (but still rated medium) birds than they did at Literary Park (Table 4-T/EJ-Inq).

East Lawn. In comparison, the Hill and swale at far edge was the only element rated higher by teachers (even though it may be too far away for use by young students). This implies that teachers perceived it as better affording Student Inquiry for "older" students (grades 3 – 5). One teacher commented East Lawn is not suitable for inquiry. Expert judgment rated the baseball backstop and infield higher; this reflects perceived higher affordances for Inquiry intelligences such as logical/mathematical, spatial, bodily/kinesthetic, and interpersonal (Table 4-T/EJ-Inq).

Table 4-T/EJ-Inq. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Student Inquiry at Each Setting

Rating-Ranking	Literary Park STUDENT INQUIRY		East Lawn STUDENT INQUIRY		Raingarden STUDENT INQUIRY	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *low*	**Teachers** *high*	**Expert Judg** *Medium*
High 3.7 - 5.0	Trees & Shrubs Grass Soil / dirt Woodchips Wood Benches & Rock Seating		Hill, swale at Far edge		Water Trees & Shrubs Perennials-wildflowers Grass Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Birds Insects	
Medium 2.0 - 3.6	Art Bench Animals Birds	Trees & Shrubs Rock with Sign Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs at Far edge Open Grass Area Soil / dirt Sidewalk at edge	Trees & Shrubs at Far edge Open Grass Area Hill, swale at Far edge Baseball Backstop/Infld	Amphibians	Water Trees & Shrubs Perennials-wildflowers Sand, soil, dirt Drain Inlet/curb-stones Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 - 1.9	Rock with Sign	Grass Soil / dirt Animals Birds	Baseball Backstop/Infld Lights Animals Birds	Soil / dirt Sidewalk at edge Lights Animals Birds	Wood Fence	Grass
Teachers' Comments	Also see Science comments.		Not suitable (1 teacher).			
Low, medium, high rankings based on summary means, Teachers' Survey elements in data tables						

Comparison of Teachers' and Expert Judgment's Grouping of Setting Elements Across Settings Related to Students' Senses / Sensory Richness Affordances.

Comparing the ratings-rankings of each settings summary means. Teachers and expert judgment rated the three settings differently in Teaching that Uses Student's Senses/Sensory Richness affordances. Teachers rated affordances higher than expert judgment; this difference may be attributed to expert judgment rating more conservatively than Teachers (Table 4-T/EJ-Sen).

Literary Park. Teachers rated slightly higher most elements' sensory affordances; this likely reflects expert judgment's more conservative rating of elements, and teachers perceived strength of Literary Park as an outdoor gathering area and classroom (Table 4-T/EJ-Sen).

East Lawn. The Hill and swale at the far edge was the only element rated higher by teachers (even though it may be "too far away for use by younger students"). This implies that teachers perceived it as better affording teaching that uses student's senses, or capitalizes on its sensory richness, for "older" students (grades 3 – 5). Note: this is a similar finding/pattern to that for Inquiry affordances; Hill and swale at the far edge was the only element rated higher by teachers. One teacher commented East Lawn is "not suitable" for teaching that uses student's senses (Table 4-T/EJ-Sen).

Raingarden. Teachers rated higher than expert judgment the grass, sand/soil/dirt, and drain inlet with curb and stones. This difference may be attributed to expert judgment's more strongly linking the affordance strength of these elements to water, which is an "intermittent" element at Raingarden, and the relatively small amount of sand/soil/dirt present there (Table 4-T/EJ-Sen).

Table 4-T/EJ-Sen. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Student Senses/Sensory Richness at Each Setting

Rating-Ranking	Literary Park STUDENT SENSES		East Lawn STUDENT SENSES		Raingarden STUDENT SENSES	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *Low*	**Teachers** *high*	**Expert Judg** *Medium*
High 3.7 - 5.0	Trees & Shrubs Grass Wood Benches & Rock Seating Art Bench		Hill, swale at Far edge		Trees & Shrubs Perennials/wildflowers Grass Sand, soil, dirt Drain Inlet-curb edge/stones Wooden walkways Wood Fence Birds Insects Amphibians	
Medium 2.0 - 3.6	Soil / dirt Woodchips Animals Birds	Trees & Shrubs Grass Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs at Far edge Open Grass Area Soil / dirt Sidewalk at edge Baseball Backstop Lights Animals	Open Grass Area	Water	Water Trees & Shrubs Perennials-wildflowers Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 - 1.9	Rock with Sign	Soil / dirt Rock with Sign Animals Birds	Birds	Trees & Shrubs at Far edge Soil / dirt Sidewalk at edge Hill, swale at Far edge Baseball Backstop Lights Animals Birds		Grass Sand, soil, dirt Drain Inlet/curb edge/stones
Teachers' Comment	Also see Science comments.		Not suitable (1 teacher).			
Low, medium, high rankings based on summary means, Teachers' Survey elements in data tables						

CHAPTER 5: INTERPRETATION OF FINDINGS AND OPPORTUNITIES FOR ITI CURRICULUM AND LESSON ACTIVITIES, FOR SETTING DESIGN, AND FOR TEACHER TRAINING/PROFESSIONAL DEVELOPMENT

This chapter interprets significant findings when comparing teachers' and expert judgment's perceptions of the presence and suitability of ITI curriculum and lesson activity affordances for teaching in Highlands Elementary School grounds using the ITI approach. Interpretations are examined across curriculum and lesson activity affordances at each setting as well across settings for each affordance. Differences between the perceptions of teachers, and expert judgment, about the presence and suitability of ITI affordances are interpreted. These differences serve as a basis for inferences regarding opportunities to improve the relationship and fit of teachers' perceptions of ITI curriculum and lesson activity affordances with curriculum and lesson activity affordances as perceived by expert judgment. Differences that form the basis of interpretations and inferences are examined in a two-way manner; Teachers' perceptions inform interpretations and inferences of expert judgment's perceptions, and vice-versa.

Inferences are presented in terms of opportunities for alteration of teaching activities, and design interventions in the school grounds settings, to enhance their suitability for teaching in the school grounds using the ITI approach. Suggestions are also offered regarding teacher training and professional development opportunities to improve this "fit."

The first part of this chapter presents an "overall" interpretation of significant findings, and related implications. Findings and implications are based on analyzing and interpreting the summary means ratings of setting elements including in the teachers' survey. Both statistically-analyzed summary means data, and data not statistically-analyzed, are used. Overall patterns of perceived differences in ITI curriculum and lesson activity component affordance presence and suitability as perceived by teachers and expert judgment across settings are presented first. A comparison of teachers and expert judgment affordance perceptions across ITI components at each setting then follows.

The second part presents differences and similarities in ITI curriculum and lesson activity component affordances as perceived by teachers and expert judgment at each setting, and across settings. Affordance presence and suitability are based on rating each setting element regarding its ITI curriculum and lesson activity suitability. Differences serve as a basis for inferences regarding opportunities to improve the relationship and fit of teachers' perceptions of ITI curriculum and lesson activity affordances with ITI affordances as perceived by expert judgment. Inferences are presented as opportunities for alteration of teaching activities, and design interventions in the three researched school grounds settings, to enhance suitability for teaching using the ITI approach. Suggestions regarding teacher training/professional development opportunities to improve the relationship and "fit" are also offered.

OVERALL INTERPRETATION OF FINDINGS

This section begins with a discussion of general or overall interpretations of findings. Overall patterns of perceived differences in ITI curriculum and lesson activity component affordance presence and suitability as perceived by teachers and expert judgment across settings (as presented in Table 4-T/EJ1 and Table 4-T/EJ2) are discussed. More detailed interpretations of findings (as presented in Tables 4-T/EJ-Sci, 4-T/EJ-Hlt, 4-T/EJ-Soc, 4-T/EJ-Inq, and 4-T/EJ-Sen) and implications are also discussed, including nuances of the interpretations of generalized patterns related to each ITI curriculum and lesson activity affordance category.

Overall Patterns of Perceived Differences Between Affordance Presence and Suitability as Perceived by Teachers and Expert Judgment Across Settings

Similar patterns were perceived in the ITI affordances for Science, Student Inquiry, and Teaching that Uses Students' Senses/Sensory Richness across settings. Teachers and expert judgment perceived similar patterns in ITI affordance suitability across settings. Teachers and expert judgment rated the Raingarden setting as having the highest level of affordances for Science, Student Inquiry, and Teaching that Uses Students Senses/Sensory Richness. For these three sets of affordances, both teachers and expert judgment rated Literary Park in the middle, and East Lawn lowest (Table 4-T/EJ1).

Teachers appeared to perceive Health affordances across settings differently than Expert Judgment. While the teachers rated East Lawn highest in Health affordances, expert judgment rated Raingarden highest in Health affordances. At East Lawn, teachers commented that they find it suitable and used it for team building games and large motor skills lessons and activities with large groups. At Raingarden, expert judgment rated its biotic and abiotic elements higher in Health affordances (based on, for example, health affordances in Food for Health and Fitness, Being and Keeping Safe, and Staying Fit and Healthy curriculum sub-strands) (Tables 4-T/EJ1, 4-T/EJ-Hlt).

Teachers appeared to perceive Social Studies affordances across settings differently than Expert Judgment. Regarding Social Studies affordances, Teachers rated Literary Park highest overall, whereas expert judgment rated Raingarden highest overall. For teachers, this reflects their comments about the classroom and gathering area affordance strength of Literary Park's seating elements (wood and rock benches, and art bench). For Social Studies affordances, expert judgment rated Raingarden highest. Highest rated was water and perennials/wildflowers; trees and shrubs, the drain inlet with curb and stones, and organisms rated medium. This reflects expert judgment's perception of the Raingarden as a man-made "garden" setting, having been purposefully created with environmental, social, economic and educational functions. Both teachers and expert judgment rated East Lawn similarly low in Social Studies affordances (Tables 4-T/EJ1, 4-T/EJ-Soc).

Comparison of Teacher and Expert Judgment Affordance Perceptions Across ITI Curriculum/Lesson Activity Components at Each Setting

Literary Park. Across all ITI curriculum and lesson activities, teachers rated ITI affordance suitability differently than did expert judgment. Teachers rated suitability medium overall, whereas expert judgment rated suitability low overall. Teachers rated Inquiry, and Sensory affordance suitability notably higher than expert judgment, Science and Social Studies higher, and Health slightly higher (Table 4-T/EJ1).

While two clusters of affordance perceptions were found for teachers as well as expert judgment, the composition of these clusters varies. Science clusters differently; teachers cluster Science

affordances with Health and Social Studies, while expert judgment clusters Science with Inquiry and Sensory affordances. For teachers, the clustering, in combination with their comments about the Science, Health, and Social Studies affordances of the seating at Literary Park, implies that teachers perceived the seating elements at Literary Park as high in gathering area and classroom affordances for teaching Science-Health-Social Studies curriculum and lesson activities. Expert judgment perceived Science-Inquiry-Sensory affordance suitability and strength in the biotic and abiotic elements, and organisms in Literary Park. (Tables 4-T/EJ2, 4-T/EJ-Sci, 4-T/EJ-Hlt, 4-T/EJ-Soc, 4-T/EJ-Inq, 4-T/EJ-Sen).

East Lawn. Across ITI curriculum and lesson activity components, teachers' ratings of ITI affordance suitability were similar overall to those of expert judgment, especially in comparison to ratings differences at Literary Park. Across all ITI components, teachers rated affordances at East Lawn as low to medium overall, whereas expert judgment rated affordances as low overall. Teachers rated Sensory, and Science affordances higher than expert judgment, Inquiry somewhat higher, and Health and Social Studies similar to expert judgment (Table 4-T/EJ1).

At East Lawn, the composition of clusters varies between the teachers and expert judgment. Teachers appear to cluster components into three subsets, while expert judgment perceptions cluster them into two subsets. Science and Sensory affordances appear to cluster differently, teachers do not cluster Science and Sensory affordances with others (they are their own subsets), while expert judgment cluster Science and Sensory affordances into the same subset.

Teachers rated the trees and shrubs at the East Lawn's far edge high in Science affordances, and the hill and swale at the far edge high in Sensory affordances; all other elements rated medium. Some teachers commented that the large, flat, open area makes perimeter/edge use a challenge for younger students that it was used little except for flying kites and weather-related science experiments, and that teachers would like more elements and habitat for Science and insect investigation. Teachers comments, and their clustering of affordance perceptions, implies that teachers perceived high Science affordances in the far edge (evergreen) trees evergreen and shrubs, and the open grass area, and high Sensory affordances in the hill and swale at the far edge, mainly for older students (for example, grades 3 – 5). Clustering, and comments, also imply that Teachers perceived the suitability of East Lawn as a large, flat, open stage-like area

affordance the teaching of Science curriculum and conducting science lesson activities (for example, weather-related science experiments). At the same time, teachers also perceived East Lawn as being lower in Sensory affordances.

Expert judgment's clustering of Science, and Sensory, reflects perceived low Science, and Sensory affordance suitability of East Lawn's setting elements. Expert judgment rated the setting low due to the low diversity of its biotic and abiotic elements, and organisms in Sensory affordances, and the distance to the setting elements at the far edge of the East Lawn (Tables 4-T/EJ2, 4-T/EJ-Sci, 4-T/EJ-Hlt, 4-T/EJ-Soc, 4-T/EJ-Inq, 4-T/EJ-Sen).

Raingarden. Across ITI curriculum and lesson activity components, teachers rated ITI affordance suitability differently than did expert judgment. Teachers rated Health affordances low, Science and Social Studies medium, Student Inquiry and Teaching that Uses Student Senses affordances high. In contrast, expert judgment rated affordance suitability relatively the same (low to medium) across components. Similar to Literary Park, teachers rated Sensory and Student Inquiry affordances higher, and Science and Social Studies suitability somewhat higher. In contrast, expert judgment rated Health affordance suitability slightly higher than teachers. *This is the only setting where expert judgment rated an ITI component (Health) suitability higher than did the teachers (Table 4-T/EJ1).*

At Raingarden, the composition of clusters varies between teachers and expert judgment. Teachers clustered components into two subsets (similar to Literary Park), while expert judgment clustered components into three subsets. Similar to Literary Park and East Lawn, Science and Sensory affordance clustering is perceived differently. Teachers cluster Science with Health and Social Studies, whereas expert judgment clusters Science with Inquiry. Teachers cluster Sensory and Inquiry affordances, while expert judgment does not cluster Sensory with other components.

Teachers rated many biotic and abiotic elements and the wooden walkways high in Science and Sensory and Inquiry affordances, whereas expert judgment rated most elements medium in these affordances. A difference is that expert judgment rated water, and biotic elements high in Science affordances, and grass, sand/soil/dirt, and the drain inlet with curb and stones low in Sensory affordances. Teachers, and expert judgment, similarly rated many elements medium in Health and

Social Studies affordances. Teachers rated the drain inlet with curb and stones, and wooden walkways higher in Health affordances, whereas expert judgment rated organisms higher in Health affordances. Teachers rated the wooden walkways and wood fence higher in Social Studies affordances, whereas expert judgment rated the drain inlet with curb and stones, and organisms, higher.

This clustering, and rating of setting elements, implies that teachers perceived higher suitability in the wooden walkways as gathering areas for teaching and lesson activities across all components. Raingarden's wooden walkways, and its biotic and abiotic elements, are perceived by teachers as strongest in affording Science, Sensory, and Inquiry teaching and lesson activities, and not as strong in Social Studies affordances. The wooden walkways, and the drain inlet with curb and stones, are perceived by teachers as stronger in affording Health (and Social Studies) teaching and lesson activities.

Expert judgment sees higher Health and Social Studies affordances in the drain inlet with curb and stones, and organisms. Expert judgment sees higher Sensory, Science, and Inquiry affordances in the biotic and abiotic elements, and organisms, due to their amount, diversity and interrelated ecological associations, and in water (which is intermittently present) (Tables 4-T/EJ2, 4-T/EJ-Sci, 4-T/EJ-Hlt, 4-T/EJ-Soc, 4-T/EJ-Inq, 4-T/EJ-Sen).

General or Overall Observations and Interpretations

Expert Judgment's lower rating of ITI curriculum and lesson activity component affordances. Teachers rated Literary Park medium in affordances overall across components, whereas expert judgment rated it low. Teachers rated East Lawn low to medium overall, expert judgment rated it low. Teachers rated Raingarden low to high overall, and expert judgment low to medium. Consistently lower affordance ratings by expert judgment likely reflects expert judgment's more conservative ratings of the ITI affordances of each setting's elements in general. The discussion below regarding teachers' experience in perceptions and ratings of small, low in height, and fewer-in-number setting elements may be a related factor in consistently lower affordance ratings by expert judgment.

Teachers' experience in perceptions and ratings of small and low (in height) setting elements. Some biotic and abiotic elements (trees and shrubs, grass, sand/soil/dirt, woodchips) are small, low in height, and/or present in small amounts. Teachers may be better able to put themselves in student's shoes in the experience in and use of such elements. Thus, teachers may perceive the affordance strengths of such elements differently (perhaps higher) than would non-teacher (or expert judgment). In many cases, grass, and sand/soil/dirt were rated higher in affordances by teachers at and across settings. Grass, and sand/soil/dirt were consistently near the top in the order-listing of elements in questions in the teachers survey. This consistent order-listing of elements may have also influenced this finding.

CURRICULUM AND LESSON ACTIVITY COMPONENTS: INTERPRETATION, INFERENCES AND OPPORTUNITIES

This section presents differences and similarities in ITI curriculum and lesson activity component affordances as perceived by teachers and expert judgment at each setting, and across settings. Affordance presence and suitability are based on rating each setting element regarding its ITI curriculum and lesson activity suitability. Differences serve as a basis for inferences regarding opportunities to improve the relationship and fit of teachers' perceptions of ITI curriculum and lesson activity affordances with ITI affordances as perceived by expert judgment. Inferences are presented as opportunities for alteration of teaching activities, and design interventions in the school grounds settings, to enhance suitability for teaching using the ITI approach, as well as suggestions regarding teacher training/professional development opportunities to improve the relationship and "fit."

For each component below, a table summarizes the Teacher's and Expert Judgment Comparison of Grouping of Setting Elements, and Opportunities, at Each Setting.

Science Curriculum Component: Interpretation, Inferences and Opportunities

"Differences" and Similarities in Science Affordance Perceptions. The teachers rated the Science affordances of elements at Literary Park and East Lawn higher in comparison to expert judgment. Teachers and expert judgment rated Science affordances similarly medium at

Raingarden. This pattern partially reflects expert judgment's more conservative rating of elements at settings.

Teachers (and expert judgment) appear to perceive similarities in the presence, strength and pattern of Inquiry, Sensory, and Science affordances at and across settings and setting elements, especially at Raingarden (based on Table 4-T/EJ2 summary means data and rankings at the top of each and within each curriculum setting comparison table).

Literary Park. Teachers rated the science affordance strength of Literary Park higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated grass, and soil/dirt, and animals higher. They commented on its use as a gathering place, with natural things to observe (plants, insects), and noted using the benches for observing using the five senses and other science units, and the trees to support science investigations. Teachers' clustering of components, and the comments above, imply that teachers perceived its trees, grass, sand/soil/dirt, and animals in combination with the settings' seating elements as best affording the teaching of Science curriculum and lesson activities (in group and classes of students) at Literary Park.

East Lawn. Teachers rated the Science affordance strength of East Lawn higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, Teachers rated some elements higher; notably the trees (evergreen) and shrubs at the far edge, and the open grass area. Some teachers commented that the large flat open area makes perimeter/edge a challenge for use for Science for younger students, that they use it little but for flying kites and weather related science experiments, and that they would like elements such as diggable soil, a water source, and habitat for better insect investigation. Teachers' clustering of components, and the comments above, implies that teachers perceived its trees and shrubs at the far edge as best affording the teaching of Science curriculum and lesson activities for older (for example, grades 3 through 5) students, and that the open grassy area best affords teaching Science and lesson activities that take advantage of the large, flat, stage-like characteristics of the area.

Expert judgment rated higher in Science affordances the baseball backstop and infield, and lights. As elements that are closer to the school building, they afford Science teaching and lesson activities for student of all grades. Like teachers, expert judgment perceives that trees and shrubs at the far edge best afford the teaching of Science curriculum and lesson activities for older students.

Raingarden. Teachers rated the Science affordance strength of Raingarden slightly higher (but still medium-rated) than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated more elements higher and a couple of elements lower than did expert judgment. Higher-rated elements included grass, sand/soil/dirt, and wooden walkways. Similarly rated (medium) of note was the drain inlet with curb and stones. Rated lower was the wood fence, birds, and amphibians. Teachers' clustering of components, and the ratings above, implies that teachers perceived higher affordances for Science curriculum and lesson activities for groups of students in Raingarden's biotic, abiotic, and built elements (especially it wooden walkways, and somewhat its drain inlet with curb and stones), but not in its organisms.

Expert judgment rated medium the Science affordances at Raingarden due to the number and diversity of biotic, abiotic, and built elements and organisms present permanently (especially high rated trees and shrubs, and perennials-wildflowers) and intermittently (highly rated water) and their interrelated ecological associations. As a man-made setting designed for stormwater management, expert judgment perceives the Raingarden as also affording the teaching of Science curriculum and lesson activities related to its storm water management function, among others, for individuals and small groups of students.

Table 5-T/EJ-Sci. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Science Curriculum, and Opportunities, at Each Setting

Rating	Literary Park SCIENCE		East Lawn SCIENCE		Raingarden SCIENCE	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *Medium*
High			Trees, Shrubs Far Edge Open Grass Area		Water Trees & Shrubs Perennials-wildflowers Grass Sand, soil, dirt Wooden walkways	Water Trees & Shrubs Perennials-wildflowers
Medium	Trees & Shrubs Grass Soil / dirt Woodchips Wood Benches & Rock Seating Art Bench Animals Birds	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench Birds	Soil / dirt Sidewalk at edge Landform Hill, swale at far edge Birds	Baseball Backstop/Infld Lights	Drain Inlet/curb/stones Insects	Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Birds Insects Amphibians
Low	Rock with Sign	Grass Soil / dirt Rock with Sign Animals	Baseball Backstop/Infld Lights Animals	Trees & Shrubs at Far Edge Open Grass Area Soil / dirt Sidewalk at edge Landform Hill, swale at far edge Animals Birds	Wood Fence Birds Amphibians	Grass
Opportunities	Added diggable soil, water source, habitat (evergreen) for better science investigation closer to building near East Lawn could extend into Literary Park; may further strengthen Science affordances, better synthesize Inquiry, Sensory affordances opportunities		-Add evergreen plants near building & setting edges -Add or enhance curriculum opportunities for Life Science (ie substrand Structure & Function of Living Systems) -Add diggable soil, water source, habitat (evergreens) for Science investigation closer to building (& Literary Park) & at south end; this may extend, enhance Science affordances, especially for younger students.		-Manmade setting; mix of elements having science-based stormwater, environmental, social, & educational functions -Integrate, enhance all Science strands esp Nature & Science of Engineerings, Practice of Eng, Interactions & STEM & Society -Add seating, stage near drain inlet; link Raingarden curriculum services and functions with pond -Add tall shrubs/smalls tree at north end wooden walkway; act as a “green link” to mound	

Opportunities to Improve the Fit between Perceptions of Teachers and Expert Judgment.

Science Curriculum and Lesson Activities. At East Lawn, evergreen plants could be added nearer the school building or at the setting edges, including its south edge with the dry streambed, and curriculum opportunities around Life Science (especially the substrand Structure and Function of Living Systems or other Science curriculum) could then be added or enhanced.

The Raingarden is a man-made setting designed with a mix of elements (for example, water, the drain inlet with curb and stones, plants) that have science-based storm water management, and environmental, social, and educational functions. As such, the setting provides opportunities for integrating and enhancing all strands of Science curriculum and lesson activities, especially in the Nature and Science of Engineering (including the Practice of Engineering, and Interactions and Science Technology Engineering and Math [STEM] and Society substrands). The addition of seating and/or a platform/stage near the drain inlet would also provide curriculum opportunities in linking the affordances, services and functions of the Raingarden with those of the pond below. For instance, standards and benchmarks related to understanding systems, both natural and designed, system components, and component and system interactions could be better afforded with such a drain inlet/pond focus and related curricular connections.

Setting Design. Teachers, and expert judgment, appear to perceive similarities in the presence, strength and pattern of Science (as well as Inquiry, and Sensory) affordances at and across settings and setting elements, especially at Raingarden.

At Literary Park, teachers' see stronger Science affordances at the setting based on the presence, strength, and use of its trees, grass, sand/soil/dirt, animals and seating/benches as an outdoor science classroom for observing natural things (plants, insects) and conducting Science investigations (for example, of birds in its trees). Diggable soil, a water source, and habitat (including evergreen plants) for better science investigation if added closer to the building in East Lawn (as noted below) could also extend into Literary Park (especially its southeast area, or south edges); this may further strengthen its Science affordances and better synthesize Inquiry and Sensory faculty affordance opportunities there.

At East Lawn, its edge elements (including evergreen trees and shrubs at the far edge) appear to afford Science opportunities for older (for example, grades 3 – 5) students. Adding diggable soil, a water source, and habitat (including evergreen plants) for Science investigation

closer to the school building (and Literary Park) and/or at the settings' south end near the dry streambed, may extend and enhance its Science curriculum and lesson activity affordances, especially for younger students.

At Raingarden, Teachers perceived greater affordances of grass, sand/soil/dirt, and wooden walkways implied opportunities for use and enhancement of the Raingarden as a gathering area/classroom. Adding seating and/or a platform/stage near the drain inlet and below its outlet would expand or extend its "gathering area/classroom" function, and would help link the Raingarden and pond below. Signs could be added that would explain the Raingarden's stormwater management and water cleansing functions and design elements. These efforts could also help enhance Science curriculum opportunities (as noted above). By adding a tall shrub or small tree at the north end of each wooden walkway, the "bridging" of understory/small trees between the Raingarden, and treed mound to the north, could be enhanced; this may enhance the movement to and use of the Raingarden by birds (rated low by teachers). Also, the adding of water manipulation elements at and near the drain inlet, curb and stones may enhance the Science curriculum and lesson activity affordances, especially before, during, and after rain and snow events; manipulation elements could include things like compost logs, rocks, found objects like pieces of wood, and inlet baffles.

Teacher Training/Professional Development. Opportunities in curriculum and lesson activity professional development could focus on the Raingarden as a man-made setting designed with a mix of elements (water, the drain inlet with curb and stones, plants) that enable science-based stormwater management, having environmental, social, and educational and functions, and the linking of the affordances of the Raingarden with those of the pond below. Curriculum areas for further development and integration may include the Nature and Science of Engineering (including the Practice of Engineering, and Interactions and STEM and Society substrands, and standards and benchmarks related to understanding systems, both natural and designed, system components, and component and system interactions).

Health Curriculum Component: Interpretation, Inferences and Opportunities

"Differences" and Similarities in Health Affordance Perceptions. Both the teachers and expert judgment perceived and rated Health affordances low across settings. Teachers rated East Lawn slightly higher, whereas expert judgment rated Raingarden slightly higher in Health affordances.

Teachers rated some East Lawn elements (the open grass area, and the sidewalk at the edge) slightly higher in Health affordances than did expert judgment.

A pattern also emerged where all settings were perceived and rated (by both the teachers and expert judgment) as low in Health affordances and low to medium in Social Studies affordances (based on Table 4-T/EJ2 summary data, and rankings at the top of each and within each curriculum setting comparison table).

Literary Park. Teachers and expert judgment both rated the Health affordances of Literary Park as low. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated grass, animals, and birds higher. Teachers commented on its use as an open area for small groups to meet, play, plan together and as a large area for presentations. Teachers clustering of components, their rating and the comments above, implies that teachers perceived its trees, grass, animals, and birds, in combination with the settings' seating elements as best affording the teaching of groups small to large/a classroom the Health curriculum (for example, by presenting curricular material) and lesson activities (for example, teacher and students meeting, playing, planning together) at Literary Park.

Expert judgment rated elements similarly, but rated grass, animals and birds lower. Similar to teachers, expert judgment perceived the trees and shrubs, in combination with the settings' seating elements, as best affording the teaching of Health to students gathered in groups ranging from small groups to a class size.

East Lawn. Teachers and expert judgment both rated the Health affordances of East Lawn as low. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated the open grass area, and sidewalk at the (near) edge higher. The baseball backstop and infield rated similarly medium. Teachers' commented that they used East Lawn for team building games, and large motor skills lessons with large groups. Teachers' clustering of components, their ratings and comments above, implies that teachers perceived its large flat open area, and to a lesser degree the baseball field (backstop and infield) as best affording the teaching of Health curriculum and use for team building games, and large motor skills related Health lesson activities with large groups. Clusters, and comments, imply that teachers perceive the sidewalk at the (near) edge as affording individuals, pairs, and small groups the opportunity to meet, play, and plan together on a small hard surface.

Expert judgment rated the open grass area lower, the sidewalk at the near edge, and the baseball backstop and infield similarly. Similar to teachers, expert judgment perceived the large

flat open grassy area and the baseball backstop and infield as best affording the teaching of Health curriculum and use for team building games, and large motor skills activities with groups of all sizes.

Raingarden. Teachers and expert judgment both rated the Health affordances of Raingarden as low. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated sand/soil/dirt, the drain inlet with curb and stones, and wooden walkways higher. Teachers' clusters, and ratings, imply that they perceived Raingarden's water, trees and shrubs, perennials/wildflowers, sand/soil/dirt, in combination with the settings' built wooden walkway elements as best affording the gathering and teaching of groups small to larger the Health curriculum and lesson activities.

Expert judgment rated birds and insects higher in Health affordances at Raingarden, and sand/soil/dirt, drain inlet with curb and stones, and wooden walkways lower that did teachers. This reflects that expert judgment perceived Raingarden's organisms on par with its water, trees and shrubs, perennials/wildflowers, as best affording the gathering and teaching of groups small to larger the Health curriculum and lesson activities. Expert judgment also perceived a synthesis in Health affordances among Raingarden's biotic and abiotic elements and organisms (for example, in Health curriculum strands of Food for Health and Fitness, Being and Keeping Safe, Staying Fit and Healthy).

Table 5-T/EJ-Hlt. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Health Curriculum, and Opportunities, at Each Setting

Rating	Literary Park HEALTH		East Lawn HEALTH		Raingarden HEALTH	
	Teachers *low*	**Expert Judg** *low*	**Teachers** *low*	**Expert Judg** *low*	**Teachers** *low*	**Expert Judg** *Low*
High			Open Grass Area Sidewalk at edge		Sand, soil, dirt	
Medium	Trees & Shrubs Grass Wood Benches & Rock Seating Animals Birds	Trees & Shrubs Wood Benches & Rock Seating Art Bench	Baseball Backstop-Infld	Open Grass Area Baseball Backstop/Infld	Water Trees & Shrubs Perennials-wildflowers Drain Inlet/curb/stones Wooden walkways	Water Trees & Shrubs Perennials-wildflowers Birds Insects
Low	Soil / dirt Rock with Sign Woodchips Art Bench	Grass Soil / dirt Rock with Sign Woodchips Animals Birds	Trees & Shrubs far edge Soil / dirt Hill & swale far edge Lights Animals Birds	Trees & Shrubs far edge Soil / dirt Sidewalk-edge Hill& swale far edge Lights Animals Birds	Grass Wood Fence Birds Insects Amphibians	Grass Sand, soil, dirt Drain Inlet/curb/stones Wooden walkways Wood Fence Amphibians
Opportunities			-Sidewalk (building edge) affords playing together on hard surface, & play & lesson activity affordances (ie Staying Fit & Healthy substrand), kinesthetic inquiry (ie with balls or other elements needing smooth hard surface), & touch, thermal sensory affordances -Widen sidewalk; may enhance Health affordances, esp for younger students -Baseball field (backstop, infield) affords team building, large motor skills; opportunities in Being& Keeping Safe, Staying Fit and Healthy substrands (ie safe play, rules of safe play), bodily/kinesthetic inquiry, hearing, touch, time/space, vestibular affordances		-Drain inlet with curb and stones; opportunities to use/enhance Being & Keeping Safe substrands & benchmarks (ie avoidance of threatening situations, safe play, potential outdoor hazards) -Birds & Insects; synthesize affordances possible from biotic, abiotic, built elements & animals: Food for Health and Fitness substrand (ie birds & insects use trees, shrubs, wildflowers for food, their homes; some are also edible plants, afford opportunities ie identifying key nutrients & sources & functions, & Being/Keeping Safe opportunities (ie stinging insects potential outdoor hazards).	

Opportunities to Improve the Fit between Perceptions of Teachers and Expert Judgment.

Health Curriculum and Lesson Activities. *At Literary Park,* perceptions of Health affordances were similar enough that opportunities were not implied.

At East Lawn, teachers perceived the sidewalk at the (near) edge as affording individuals, pairs, and small groups the opportunity to meet, play, and plan together on a small hard surface, implying for instance, play and lesson activity affordances in the Staying Fit and Healthy curriculum substrand, bodily/kinesthetic inquiry and touch and thermal sensory affordances, with things like balls or other elements needing a smooth hard surface. Expert judgment perceived the baseball backstop and infield as similar to the open grass area in suitability in affording team building games, and large motor skills lessons and activities with large groups and classes. As such, Health affordances opportunities are implied in the Being and Keeping Safe, and Staying Fit and Healthy substrands (for example, safe play and rules of safe play), as well as bodily/kinesthetic inquiry, and hearing, touch, time/space, and vestibular sensory affordances.

At Raingarden, teachers rated higher in Health affordances the drain inlet with curb and stones; this implies opportunities in the use or enhancement of Being and Keeping Safe substrands and benchmarks such as avoidance of threatening situations, safe play, and potential outdoor hazards. Expert judgment rated Health affordances higher for birds and insects; this implies curriculum opportunities that could help capture and use the synthesis of affordances possible from Raingarden's biotic, abiotic, and built elements and animals. For example, Food for Health and Fitness curriculum substrand opportunities are implied related to the birds and insects and the Raingarden plants (trees and shrubs, perennials/wildflowers) that birds and insects use for food and call home. Some of these plants are also edible plants, and afford curriculum and lesson activity opportunities (for example in identifying significant nutrients and their sources and functions). The birds and insects and the Raingarden plants also may afford Being and Keeping Safe curriculum opportunities, for example, stinging insects could be potential outdoor hazards.

Setting Design. *At East Lawn,* teachers rated the sidewalk at the (near) edge higher than did expert judgment. This implies Health opportunities, especially for younger students. Being a flat, smooth, hard surface the sidewalk affords small to large motor skills activities with things like balls, and things that can more easily be pulled, pushed or ridden (such as carts, trikes, bikes, etc) on a sidewalk. The sidewalk is the only hard surface on the east side of the school grounds; some widening of the sidewalk may enhance the range and breadth of such Health affordances, especially for younger students. The sidewalk could be widened the whole length of the setting

edge (from the school building doors to the north end of the sidewalk), or along just the East Lawn's setting edge.

At Raingarden, the previous Science comments regarding adding a tall shrub or small tree at the north end of each of the two wooden walkway applies. Adding plants may enhance the movement of birds and insects to the Raingarden from the adjacent mound setting. This may enhance Health curriculum opportunities as discussed in Health Curriculum and Lesson Activities. Adding seating or a platform/stage near the drain inlet, and at its outlet, may provide a visual connection in linking the Health affordance curriculum opportunities (such as Being and Keeping Safe) of the drain inlet with those of the pond below.

Teacher Training/Professional Development. Opportunities in Health curriculum and lesson activity professional development could focus on the East Lawn, and Raingarden. Curriculum areas for further development and integration at East Lawn could focus on the: a) Staying Fit and Healthy curriculum substrand; b) bodily/kinesthetic inquiry (using things like balls or other elements needing a smooth hard surface); and c) touch and thermal sensory affordances. Being and Keeping Safe. The Staying Fit and Healthy substrands could also be areas of professional development (for example, safe play and rules of safe play), as could affordances for hearing, touch, time/space, and vestibular sensory. At Raingarden, development could focus on Being and Keeping Safe substrands and benchmarks such as avoidance of threatening situations, and potential outdoor hazards (for example, stinging insects could be "potential outdoor hazards").

Social Studies Curriculum Component: Interpretation, Inferences and Opportunities

"Differences" and Similarities in Social Studies Affordance Perceptions. Teachers rated the Social Studies affordances of elements at Literary Park and Raingarden higher in comparison to expert judgment. Teachers and expert judgment both rated Social Studies affordances low at East Lawn. This pattern reflects expert judgment's more conservative rating of elements at the settings.

A pattern also emerged where all settings were perceived and rated (by both the teachers and expert judgment) as low to medium in Social Studies affordances, and low in Health affordances (based on Table 4-T/EJ2 summary data, and rankings at the top of each and within each curriculum setting comparison table).

Literary Park. Teachers rated the Social Studies affordances of Literary Park higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated grass, soil/dirt, the rock with sign, animals, and birds higher. Expert judgment rated woodchips higher than did teachers. Two teachers commented that the art bench supported literary connections and author studies. Teachers clustering of components, their ratings and the comments above, implies that teachers perceived Literary Park's trees and shrubs, grass, rock with sign, animals, and birds, in combination with the settings' bench elements (especially the art bench) as best affording the teaching of Social Studies curriculum and lesson activities, especially as they relate to literary/reading connections and author studies.

East Lawn. Teachers and expert judgment both rated the Social Studies affordances of East Lawn as low. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated higher the (evergreen) trees and shrubs at the far edge, soil/dirt, and the sidewalk at the (near) edge of the setting. Two teachers commented that East Lawn is not suitable for Social Studies; they did not say why. Teachers' clustering of components, and their data and comments, implies that teachers perceived its trees and shrubs and hill and swale at the far edge as best affording the teaching of Social Studies for older students, and the open grass area, and sidewalk at the near edge better affording the teaching of Social Studies for younger students (grades K – 2).

Expert judgment rated higher in Social Studies affordances the baseball backstop and infield. Expert judgment perceived affordances for pair, small group, and classroom social and interpersonal interaction and cooperative learning centered on team building games, and large motor skills activities in the backstop and infield area.

Raingarden. Teachers rated the Social Studies affordances of Raingarden higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated higher its perennials/wildflowers, grass, sand/soil/dirt, wooden walkways, and wood fence. Teachers' clustering of components, and their ratings and comments, implies that teachers perceived Raingarden's perennials/wildflowers, grass, sand/soil/dirt, in combination with its wooden walkways, and wood fence as best affording the teaching of Social Studies to pairs and small groups of students in the Raingarden.

Expert judgment rated higher the Social Studies affordances of the drain inlet with curb and stones, and birds. Expert judgment perceived affordance suitability in the Raingarden as a man-made setting with a purposefully designed mix of elements (water, drain inlet with curb and

stones, plants) that enables science-based stormwater management, and has environmental, social, and educational functions. The higher rating of the drain inlet area also reflects affordances in linking the functions of the Raingarden with those of the pond below (which also has storm water management functions, but are not explicitly apparent).

Table 5-T/EJ-Soc. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Social Studies Curriculum, and Opportunities, at Each Setting

Rating	Literary Park SOCIAL STUDIES		East Lawn SOCIAL STUDIES		Raingarden SOCIAL STUDIES	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *low*	**Expert Judg** *Low*	**Teachers** *medium*	**Expert Judg** *Low*
High					Perennials-wildflowers	
Medium	Trees & Shrubs Grass Rock with Soil / dirt Sign Wood Benches & Rock Seating Art Bench Animals Birds	Trees & Shrubs Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs at Far Edge Open Grass Area Soil / dirt Sidewalk at edge Hill, swale at Far edge	Open Grass Area Hill, swale at Far edge Baseball Backstop/Infld	Water Trees & Shrubs Grass Sand, soil, dirt Wooden walkways Wood Fence Insects	Water Trees & Shrubs Perennials-wildflowers Drain Inlet/curb/stones Birds Insects
Low	Woodchips	Grass Soil / dirt Rock with Sign Animals Birds	Baseball Backstop/Infld Lights Animals Birds	Trees & Shrubs at Far Edge Soil / dirt Sidewalk at edge Lights Animals Birds	Drain Inlet/curb/stones Birds Amphibians	Grass Sand, soil, dirt Wooden walkways Wood Fence Amphibians
Opportunities			-Baseball field (backstop & infield); affordances for instruction, social & interpersonal interaction, cooperative learning centered on team building games & large motor skills activities -Localized/school grounds scale interpretation & use of Geography Concepts of Location, Places and Regions substrands/benchmarks (ie describing settings, human feature boundaries like trees, shrubs at far edge) -Plant evergreens at edges, near Literary Park; may enhance Social Studies (& Inquiry, Sensory) affordances linking Geography's Location, Places and Regions substrands		-Drain inlet with curb & stones: identify, expand, at school grounds scale, Geography's Human/Environment Interactions substrand (ie identifying, understanding physical & environmental influences of humans); may better enable understanding of Raingarden as "man-made" with environmental, social, educational functions. Also link curriculum to pond below -Add seating, platform, interpretive signs at & below drain inlet to enhance Social Studies related gathering area affordances, and link with pond below	

Opportunities to Improve the Fit between Perceptions of Teachers and Expert Judgment.

Social Studies Curriculum and Lesson Activities. *At Literary Park,* no opportunities for improving the fit were inferred.

At East Lawn, expert judgment rated the Social Studies affordances of the baseball backstop and infield higher than did the teachers. Expert judgment ratings imply greater perceived affordances for instruction, social and interpersonal interaction and cooperative learning at the baseball field centered on team building games and large motor skills activities by students in pairs, small groups and in teams. Affordance opportunities are also inferred in a more localized/school grounds scale interpretation and use of Social Studies' geography curriculum and its Concepts of Location, and Places and Regions substrands and benchmarks (for example, describing settings, including human feature boundaries, such as the trees and shrubs at the far edge).

At Raingarden, expert judgment rated higher the Social Studies affordances of the drain inlet with curb and stones as well as birds as having a high perceived affordance suitability. This human-made setting containing a purposefully designed mix of elements contains an affordance suitability for science-based stormwater management, and it has additional environmental, social, and educational functions. This implies an opportunity to identify and expand, at a school grounds scale, the Human/Environment Interactions substrand of Geography curriculum (for example, identifying and understanding the physical and environmental influences of human activities) that better enable the teaching and understanding of the Raingarden as a man-made setting with environmental, social, and educational functions.

The higher rating of the drain inlet area also implies opportunities to link, using curriculum, the functions of the Raingarden with those of the pond below (which also has storm water management functions, but are not as readily apparent).

Setting Design. *At Literary Park,* no opportunities for improving the fit through interventions in the setting design were inferred.

At East Lawn, teachers perceived its trees and shrubs at the far edge, open grass area, sidewalk at the near edge, and hill and swale at the far edge as best affording the teaching of Social Studies. Teacher's comments (for other curriculum/lesson activity components) indicated that the trees and shrubs, and hill and swale at the far edge were too far away for use by younger students (for example, grades K-2). Planting evergreen shrubs or trees near Literary Park, and East Lawn's near edges, may help enhance Social Studies (as well as Inquiry, and Sensory)

curriculum affordance opportunities associated with the Location, and Places and Regions substrands of the Geography curricular strand.

At Raingarden, teachers rated higher in Social Studies affordances its perennials/wildflowers, sand/soil/dirt, wooden walkways, and the wood fence. Expert judgment rated higher the suitability of the drain inlet with curb and stones, and birds. The differences imply that Teachers perceived the Raingarden, especially its wooden walkways, as having affordance suitability as a gathering area and small classroom for teaching Social Studies. These differences imply an opportunity to strengthen the gathering and small classroom affordances of the Raingarden setting by synthesizing these affordances across its wooden walkways, and the drain inlet and curb including the area on top of and behind the curb. Adding seating, a platform, educational/interpretive signs at or below the drain inlet would enhance the Social Studies related gathering area affordances at the Raingarden. Adding these elements would also provide opportunities to link the affordances of the Raingarden with those of the pond below (which also has storm water management functions, but are not as readily apparent).

Teacher Training/Professional Development. Opportunities to expand and enhance Social Studies affordances in curriculum and lesson activity professional development could focus on the East Lawn, and Raingarden. Areas for further development and integration at East Lawn could focus on affordances for students in pairs, small groups, and in a class, and social and interpersonal interaction and cooperative learning centered on team sports in the baseball field. At Raingarden, development could focus on the affordances of the drain inlet with curb and stones as a “man-made setting” that includes multiple functions.

Student Inquiry Lesson Activity Component: Interpretation, Inferences and Opportunities

Differences and Similarities in Student Inquiry Affordance Perceptions. Teachers rated the Inquiry affordances of elements at the Literary Park and Raingarden, and to a lesser degree at East Lawn, higher than did expert judgment. This reflects expert judgment’s more conservative rating of elements at settings.

Teachers and expert judgment appeared to perceive similarities in the presence, strength and pattern of Inquiry, Sensory, and Science affordances at and across settings and setting

elements, especially at Raingarden (based on Table 4-T/EJ2 summary means data and rankings at top of each and within each curriculum setting comparison table).

Literary Park. Teachers rated the Inquiry affordances of Literary Park higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated higher the trees and shrubs, grass, soil/dirt, woodchips, and wood benches and rock seating. Teachers' clustering of components, and the data above, implies that teachers perceived its trees and shrubs, grass, soil/dirt, and woodchips in combination with the setting's bench elements as best affording Student Inquiry for individuals, pairs, small groups, and a class.

Teachers' clustering of components, the data above, and previously noted Science comments, implies an Inquiry-Science-Sensory curriculum and lesson activity connection, especially for younger student. This synthesis emanates from the teachers' comments about the use of Literary Park for observing using the five senses and other science units.

East Lawn. Teachers rated the Inquiry affordances of East Lawn higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated the hill and swale at far edge, and the sidewalk at the (near) edge, higher than did expert judgment. One teacher commented that East Lawn is not suitable for Inquiry, but did not specify why. Given teachers' clustering of components, their data, and the Inquiry-Science components connection/synthesis as implied above, and that the distance to the hill and swale at the far edge may be too far away for younger students to experience, this implies that the hill and swale at the far edge better afford Inquiry activities for older students (grades 3 – 5).

Expert judgment rated the baseball backstop and infield higher in Inquiry affordance. Expert judgment perceived Inquiry affordances centered on the spatial (space relationships), bodily-kinesthetic (movement), logical (mathematical-number reasoning), and interpersonal (people relationship) modes of intelligences of baseball backstop and diamond-shaped infield setting elements.

Raingarden. Teachers rated the Inquiry affordances of all Raingarden elements (except the wood fence) higher than did expert judgment. This reflects a general more conservative rating of affordances by expert judgment. In evaluating the contribution of specific elements of the setting to overall affordance ratings, teachers rated the wood fence low in Inquiry affordances. Teachers' clustering of components, and the data above, implies that teachers perceived all biotic

and abiotic elements, and organisms, in combination with wooden walkways, as affording Student Inquiry for individuals, pairs, small groups, and a class.

Expert judgment rated grass low in Inquiry affordances at Raingarden. Expert judgment perceived Inquiry affordances at the Raingarden similarly to affordances as perceived by teachers.

Table 5-T/EJ-Inq. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Inquiry Opportunities, at Each Setting

Rating	Literary Park STUDENT INQUIRY		East Lawn STUDENT INQUIRY		Raingarden STUDENT INQUIRY	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *low*	**Teachers** *high*	**Expert Judg** *Medium*
High	Trees & Shrubs Grass Soil-dirt Woodchips Wood Benches & Rock Seating		Hill, swale at Far edge		Water Trees-Shrubs Perennials-wld Grass Sand-soil-dirt Drain inlet-curb-stones Wood walks Birds Insects	
Medium	Art Bench Animals Birds	Trees & Shrubs Rock with Sign Woodchips Wood Benches & Rock Seating Art Bench	Trees & Shrubs at Far edge Open Grass Area Soil / dirt Sidewalk at edge	Trees & Shrubs at Far edge Open Grass Area Hill, swale at Far edge Baseball Backstop/Infld	Amphibians	Water Trees-Shrubs Perennials-wld Sand,-soil-dirt Drain inlet-curb-stones Wood walks Wood Fence Birds Insects Amphibians
Low	Rock with Sign	Grass Soil / dirt Animals Birds	Baseball Backstop/Infld Lights Animals Birds	Soil / dirt Sidewalk at edge Lights Animals Birds	Wood Fence	Grass
Opportunities	-Larger amount, diversity of plants; Inquiry curriculum & lesson activity opportunities (ie linguistic, spatial, naturalistic) that recognize, expand on setting diversity, ecology -Add flowering, fruiting plants; increase diversity to attract more birds & animals		-Implied Inquiry-Science relationship/synthesis -Plant evergreens near edges, sidewalk to enhance Inquiry (ie linguistic, naturalistic) -Baseball backstop and infield; add, enhance Inquiry, spatial, bodily-kinesthetic, logical-mathematical, and interpersonal modes (ie shapes within chain link fence & logical-mathematical, spatial Inquiry) esp for younger students -Added diggable soil, water source, habitat (for Science) close to building, Literary Park & Lawn's south edge; to extend Inquiry (ie linguistic, interpersonal, naturalistic) affordances		-Implied opportunity to better sythesize Inquiry-Sensory-Science strands (ie Nature & Science & Practice of Eng) & add seating or stage near drain inlet; provides/links Raingarden inquiry & curriculum services & functions with pond below - Teachers & author perceived Inquiry affordances relatively similarly; minor differences re Sensory and Social Studies (not discussed in detail in text in thesis section)	

Opportunities to Improve the Fit between Perceptions of Teachers and Expert Judgment.

Student Inquiry Curriculum and Lesson Activities. *At Literary Park,* teachers (and expert judgment) rated animals and birds lower in Inquiry affordances than other elements. These ratings imply less perceived Inquiry affordances for animals, and especially birds. Given the relatively large amount and diversity of biotic/plant elements at Literary Park, Inquiry curriculum and lesson activities (such as linguistic, spatial, and naturalistic) that also recognize and expand on the plant and animal diversity and ecological relationships at Literary Park are likely to be opportunities to improve fit.

At East Lawn, teachers perceived that the distance to the hill and swale at the far edge may be too far away for younger students to experience; this implies that the hill and swale (and the [evergreen] trees and shrubs at the far edge) better afford Inquiry activities for older students. The combination of hill and swale, and adjacent trees and shrubs, implies an opportunity to synthesize Inquiry lesson activities based on linguistic, logical/mathematical, spatial, interpersonal, and especially the naturalistic-nature smart intelligence modes of intelligence focused on students in grades 3 – 5.

Expert judgment rated the baseball backstop and infield higher in Inquiry affordance. This higher rating implies the opportunity to add or enhance Inquiry lesson activities based on spatial, bodily-kinesthetic, logical-mathematical, and interpersonal inquiry modes of intelligences. For example, the shape of the baseball infield "diamond" and/or the design and shapes within the backstops' chain link fence provides Inquiry opportunities based on the logical/mathematical, spatial, and perhaps interpersonal modes of intelligences. Given that the baseball backstop is close to the school building, Inquiry opportunities might focus on younger students (grades K - 2).

At Raingarden, teachers & author perceived Inquiry affordances relatively similarly; see Setting Design below.

Setting Design. *At Literary Park,* teachers (and expert judgment) rated animals and birds lower in Inquiry affordances than other elements. There is some diversity in plant materials that attract birds (and animals). Selectively adding flowering and fruiting plants (small trees, shrubs, and perennials) may increase plant diversity in a way that attracts more birds and animals.

At East Lawn, the clustering and data above, and related Science comments, imply that teachers perceived the (evergreen) trees and shrubs as being too far away for Inquiry by younger

students/grades K - 2. Planting evergreen shrubs or trees near East Lawn's near edges and sidewalk may enhance Inquiry opportunities (such as linguistic, and naturalistic). Given the implied Inquiry-Science relationship/synthesis as noted previously, and teachers' Science comments, adding diggable soil, a water source, and habitat for better science investigation closer to the school building, and Literary Park, or at East Lawn's south edge near the dry streambed, may extend Inquiry affordances (such as linguistic, interpersonal [people] and naturalistic [nature smart]).

At Raingarden, adding seating or stage near drain inlet; provides and strengthens Raingarden inquiry & curriculum services & functions with the pond below.

Teacher Training/Professional Development. Training and professional development opportunities could focus on Inquiry related to the baseball backstop and infield. For instance, further exploration into the logical (mathematical-number reasoning) aspects of the backstop's chain link fence and its multiple single wire elements interwoven into a flexible metal fabric with diamond/square openings could be developed. Spatial, and perhaps interpersonal modes of intelligences could similarly be explored. Should water, diggable soil, and habitat for better Science investigation (and Inquiry) be added at the edges of East Lawn, exploration of new or related Inquiry modes could be pursued, perhaps with a focus on younger students (grades K – 2).

Teaching Using Students' Senses/Sensory Richness Lesson Activity Component: Interpretation, Inferences and Opportunities

"Differences" and Similarities in Student Senses/Sensory Richness Affordance Perceptions. Teachers rated the Teaching that Uses Students Senses/Sensory Richness affordances of elements at the Literary Park and Raingarden, and to a lesser degree at East Lawn, higher in comparison to expert judgment. This reflects expert judgment's more conservative rating of elements.

Teachers and expert judgment appear to perceive similarities in the presence, strength and pattern of Sensory, Inquiry, and Science affordances at and across settings and setting elements, especially at Raingarden (based on statistical Table 4-T/EJ2 summary means data and rankings at top of each and within each curriculum setting comparison table).

Literary Park. Teachers rated the Sensory affordances of Literary Park higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall

Sensory affordance ratings, teachers rated all elements (except the rock with sign) higher than did expert judgment. Teachers' clustering of components, and their data, and teacher's related Science comments, imply that teachers perceived its trees and shrubs, grass, soil/dirt, woodchips, and animals and birds in combination with the setting's bench elements as best affording Teaching that Uses Student's Senses/Sensory Richness for students as individuals, pairs, small groups, and in a class, especially for observing natural things (plants, insects) using the five senses.

Teachers clustering of components, the data above, and previously noted Science comments, implies an Sensory-Inquiry-Science curriculum and lesson activity connection and synthesis centered on teachers comments about the use of Literary Park for observing using the five senses and other science units (especially for younger students).

East Lawn. Teachers rated the Sensory affordances of East Lawn higher than did expert judgment. In evaluating the contribution of specific elements of the setting to overall Sensory affordance ratings, teachers rated all elements (except birds) higher than did expert judgment, especially the hill and swale at the setting's far edge. Previous Science comments, teachers' clustering of data, and the data above implies that the hill and swale are perceived as being too far away for Sensory lesson activities by younger students. These Sensory activity and experience affordances may be better suited for older (grades 3 – 5) students. The (evergreen) trees and shrubs at the far edge may help to draw teachers and older students to this edge, and to the hill and swale.

Raingarden. Teachers rated the Sensory affordances of all Raingarden elements (except water) higher than did expert judgment. Expert judgment rated grass, sand/soil/dirt, and the drain inlet with curb edge and stones lowest. This difference may be attributed to grass, and sand/soil/dirt being present in small amounts, and expert judgment's linking the Sensory affordances of the drain inlet with curb and stones with water, which is an intermittently present element.

Table 5-T/EJ-Sen. Teachers and Expert Judgment; Comparison of Grouping of Setting Elements, Teaching Using Student's Senses Curriculum, and Opportunities, at Each Setting

Rating	Literary Park STUDENT SENSES		East Lawn STUDENT SENSES		Raingarden STUDENT SENSES	
	Teachers *medium*	**Expert Judg** *low*	**Teachers** *medium*	**Expert Judg** *low*	**Teachers** *high*	**Expert Judg** *Medium*
High 3.7 - 5.0	Trees & Shrubs Grass Wood Benches & Rock Seating Art Bench		Hill, swale at Far edge		Trees, Shrubs Perennials/wld Grass Sand, soil, dirt Drain Inlet-curb-stones Wood walks Wood Fence Birds Insects Amphibians	
Medium 2.0 - 3.6	Soil / dirt Woodchips Animals Birds	Trees & Shrubs Grass Woodchips Wood Benches & Rock Seating Art Bench	Trees, shrubs edge Open Grass Soil-dirt Sidewalk edge Baseball Backstop Lights Animals	Open Grass Area	Water	Water Trees & Shrubs Perennials-wildflowers Wooden walkways Wood Fence Birds Insects Amphibians
Low 1.0 - 1.9	Rock with Sign	Soil / dirt Rock with Sign Animals Birds	Birds	Trees & Shrubs at Far edge Soil / dirt Sidewalk at edge Hill, swale at Far edge Baseball Backstop Lights Animals Birds		Grass Sand, soil, dirt Drain Inlet/curb edge/stones
Opportunities	-Add flowering, fruiting plants; increase plant diversity & attract more birds & animals to enhance sensory activities (ie sight, hearing, touch) -If water source added at East Lawn; extended into Literary Park, provide-strengthen Sensory affordances (humidity, touch, taste); better synthesize Sensory, Science, and Inquiry affordances		-Implied; hill-swale, evergreens at far edge better afford activities for older students, opportunity to synthesize Sensory activities (ie touch, smell, sight, temperature, humidity) for grades 3-5 -Plant evergreens near Lawn's near edges, sidewalk, and adding diggable soil, water source, habitat closer to building, to enhance Sensory (hearing, taste, touch, smell, sight, humidity, temperature)		-Drain inlet with curb and stones; water is "intermittent"; its function related to rain events, melting of snow & ice. Seeing, hearing, touching, smelling water, snow, in ponded or frozen states, and when melting & moving be pursued and enhanced. -Manipulate melting and moving water; add compost logs, rocks, inlet baffles, scoops, buckets, pieces of wood, brushes for water painting, etc	

Opportunities to Improve the Fit between Perceptions of Teachers and Expert Judgment.

Students' Senses/Sensory Richness Lesson Activities. *At Literary Park,* teachers and expert judgment both rated animals and birds lower in Sensory affordances than they did other elements. The setting contains a diversity of plant materials that attract birds and other animals. Selectively adding flowering and fruiting plants (small trees, shrubs, and perennials) may increase plant diversity in a way that attracts more birds and animals and enhances. This would enhance sensory lesson activities (for example, around hearing, sight, and touch sensory faculties).

At East Lawn, teachers perceived that the distance to the hill and swale at the far edge may be too far away for younger students to experience; this implies that the hill and swale (and the [evergreen] trees and shrubs at the far edge) better afford Sensory activities for older students. The combination of hill and swale, and adjacent trees and shrubs, may provide an opportunity to work together/synthesize Sensory lesson activities (such as those related to touch, smell, sight, temperature, and humidity sensory faculties) for students in grades 3 – 5.

At Raingarden, expert judgment rated the drain inlet with curb and stones low in Sensory affordances because the water there would only flow into and through the drain inlet intermittently. This implies opportunities for Sensory curriculum and lesson activities, in understanding the intermittent nature of this system, and its function related to rain events and the melting of snow and ice. Inquiry curriculum and lesson opportunities to see, hear, touch, and smell water, and snow, in their ponded or frozen states, and when melting and moving could be further pursued and enhanced.

Setting Design. *At Literary Park,* teachers and expert judgment both rated animals and birds lower in Sensory affordances than they did other elements. There is some diversity in plant materials that attract birds (and animals), Selectively adding flowering and fruiting plants (small trees, shrubs, and perennials) may increase plant diversity in a way that attracts more birds and animals, and enhances opportunities for Sensory activities (especially in the hearing, taste, touch, smell, sight, temperature sensory faculties). Should a water source be added at the East Lawn, it could be extended for use into the Literary Park, and could provide additional opportunities to strengthen Sensory affordances (in humidity, touch, and taste faculties) and better synthesize Literary Park's Sensory, Science, and Inquiry affordances.

At East Lawn, teachers clustering of elements, and data above, and related Science comments, imply that teachers perceived the (evergreen) trees and shrubs as being too far away

for Sensory activities by younger students (grades K – 2). Planting evergreen shrubs or trees near East Lawn's near edges and sidewalk may enhance Sensory opportunities (in hearing, taste, touch, smell, sight, and temperature faculties). Given the inferred Sensory-Inquiry-Science relationship/synthesis previously noted, and teachers' Science comments, adding diggable soil, a water source, and habitat for better science investigation closer to the school building, and Literary Park, or at East Lawn's south edge near the dry streambed, may extend Sensory affordances (especially for touch, taste, and humidity faculties).

At Raingarden, Teachers perceived greater Sensory affordances in the drain inlet with curb edge and stones. This implies opportunities for Sensory curriculum and lesson activities in providing a better understanding the intermittent nature of this system as well as its function related to rain events and the melting of snow and ice. Opportunities to see, hear, touch, and smell water and snow, in their ponded or frozen states, and manipulate water when melting and moving could be further pursued and enhanced by adding water manipulation elements like compost logs, rocks, inlet baffles, scoops and buckets, found objects like pieces of wood, brushes for water painting, etc.

Teacher Training/Professional Development. Training and professional development opportunities could focus on Sensory related opportunities in the Raingarden, especially at the drain inlet with curb and stones. This training would help teachers understand and be able to convey in lesson activities the sensory differences of water in their ponded or frozen states. Such training might also make Teachers better able to relate the effects of manipulating melting and moving water through the use of elements such as compost logs, rocks, inlet baffles, scoops and buckets, found objects like pieces of wood, and brushes for water painting.

CHAPTER 6: CONCLUSIONS

The Problem

The "outdoor play and learning" settings on the school grounds at Highlands Elementary School (Highlands) in Edina, MN were originally planned, designed, and constructed for "play," not for teaching and learning. The development of play areas after 2009 included a focus on learning in the settings in addition to play. Planning and design of the school grounds now created a "multi-layered approach" to the site, geared towards play of students of different ages, abilities, and stages of human development.

Use of the school grounds settings in delivering the Highlands Integrated Thematic Instruction approach and curriculum varied among teachers. Results from a survey, a post-survey debriefing and follow-up, and discussions with teachers suggest that some teachers had difficulty understanding how the various play area settings could be used in delivering Highlands' curriculum to students of various ages. They were unfamiliar with ways in which a setting's *attributes* may be used to realize its potential in educating Highlands' students. The teachers were unaware, or less aware, of the learning affordance opportunities that the play area settings and their attributes offer for supporting the implementation of Highlands Integrated Thematic Instruction (or ITI) approach in the school grounds outdoor settings.

What Happened

After an extensive literature review, and meetings and discussion with Highlands' staff and teachers and University of Minnesota staff, six research questions were developed which helped form the basis of the research, and guided its operationalization (concepts, methods, findings, interpretation, and discussion).

The author hypothesized that by identifying and interpreting Highlands teachers' perceptions of the school grounds ITI affordances, and comparing the teachers' perceptions with the expert judgment perceptions of "actual ITI affordances," opportunities for ITI curriculum and lesson activities, setting design, and for teacher training/professional development could be identified in ways that may improve the fit of the teachers' perceptions of affordances with the

affordances as perceived and interpreted by the Author using his “expert judgment”. Opportunities could be identified and interpreted at each setting, and across settings.

Three outdoor settings located on the east side of Highlands’ school grounds, were selected and used in the research. The settings were the Literary Park, East Lawn, and Raingarden. Then:

1. Literary Park, East Lawn, and Raingarden setting elements were rated and interpreted by expert judgment regarding their ITI affordance presence and suitability related to statewide and Edina Public School District curriculum standards and lesson activities for teaching Science, Health, and Social Studies, in Student Inquiry, and in teaching that uses Students’ Senses/Sensory Rich lesson activities using the ITI approach as practiced at Highlands Elementary School.

2. A survey was administered to Highlands teachers to illicit how they perceived the ITI affordance presence and suitability of setting elements for teaching Science, Health, Social Studies, in Student Inquiry, and Sensory Rich lesson activities.

3. Survey results, and expert judgment ratings, were used to analyze and interpret, across the three settings, how teachers and the expert judgment perceived the affordances of the settings for teaching science, health, social studies, in student inquiry, and sensory rich lesson activities.

4. Analyzed and interpreted survey results and expert judgment ratings were examined to see how teachers’ and the authors’ expert judgment ratings of affordance presence and suitability varied across settings.

5. Where differences and patterns were found, interpretations and inferences were developed as to why there were differences in perceptions.

6. Lastly, differences served as a basis for inferences regarding opportunities to improve the relationship and fit of teachers’ perceptions of ITI curriculum and lesson activity affordances with ITI affordances as perceived by expert judgment. Inferences were presented as opportunities for alteration of teaching activities, and design interventions in the school grounds settings, to enhance suitability for teaching using the ITI approach, as well as suggestions regarding teacher training/professional development opportunities to improve the relationship and “fit.”

What Was Found

The research found that the ratings and perceptions of ITI affordance presence and suitability of Highlands’s teachers’ differed from the authors’ expert judgment ratings and perceptions. These

differences varied with the nature of the educational setting as well as the ITI curriculum component being examined. Where differences were found, interpretations and inferences were postulated as to reasons for their existence. Differences served as a basis for inferences regarding opportunities to improve the relationship and fit of teachers' perceptions of ITI curriculum and lesson activity affordances with ITI affordances as perceived by expert judgment. Inferences were presented as opportunities for alteration of teaching activities, and design interventions in Highlands' school grounds settings, to enhance suitability for teaching using the ITI approach, as well as suggestions regarding teacher training/professional development opportunities to improve the relationship and "fit."

In general, similar patterns were perceived in the ITI affordances for Science, Student Inquiry, and Teaching that Uses Students' Senses/Sensory Richness across settings. However, teachers appeared to perceive Health, and Social Studies affordances across settings differently than did expert judgment.

Some of the differences in perceptions may also be due to the author being a designer and not a teacher. One aspect of this includes that, as a designer, the author evaluated affordance strength based on setting elements present now and their affordance possibilities (now and in the future), for example, the mix and diversity of plants in the Raingarden afforded a diversity and quantity of insects and birds etc not necessarily observed by the author in the field. Also, the author visited the settings in the winter, but at that winter site visit there was not snow, nor did the author visit the settings during rainstorm events.

The author also had limited exposure to, or observations of, teachers teaching in the study settings; this may have also influenced some of the differences in perceptions.

Opportunities for the Future

The findings and opportunities of this study are specific to Highlands elementary school, and are based on when the study was conducted, and the "conditions" of the settings and institution (its ITI approach, teachers, and principal) at that time. Overall, this study found similar patterns in ITI affordances for Science, Student Inquiry, and Teaching that Uses Students' Senses/Sensory

Richness across settings as perceived by both teachers and expert judgment. However, teachers appeared to perceive Health, and Social Studies affordances across settings differently than did expert judgment. Opportunities for alteration of teaching activities, and design interventions in Highlands' school grounds settings, to enhance suitability for teaching using the ITI approach, as well as suggestions regarding teacher training/professional development opportunities to improve the relationship and "fit," are expected to be reviewed by Highlands principal Peter Hodne and teachers and staff and committees, and be selectively used to help make teaching, setting, and training changes at Highlands. Some of the study findings, and related opportunities, may be similar to ideas that Highlands teachers and staff have about ways to enhance suitability for teaching using the ITI approach at Highlands; these correlation may help to identify "higher-strength" or higher-priority opportunities.

However, based on the literature review, and activities performed while conducting this study, it appears that little research has been done to better understand teachers' perceptions regarding the ways in which an outdoor school grounds setting's attributes may be used to realize its potential in educating their students, especially for schools that use an Integrated Thematic Instruction (ITI) teaching and lesson activity approach.

This study represents a unique research methodology that could be replicated for research at elementary schools that use, or are considering the use, of an ITI (or similar) approach to better understand teachers' perceptions regarding the ways in which their schools outdoor setting's attributes may be used to realize its potential in educating their students. Additional research conducted in this vein, at elementary schools across the United States and elsewhere, may help build a research basis for understanding perceptions of, and opportunities for, teacher training and teaching activities, and elementary school ground setting design, to enhance the suitability of school ground settings for teaching using the ITI (or a similar integrated curriculum) approach.

The study approach, methods, and limitations as noted above point to a couple of areas regarding what might be done differently in the future if a similar study where to be conducted, 1) spend an adequate amount of time observing the "comparees" (the teachers in this case) using/teaching in the study settings throughout the seasons of use to get a better understanding of their use and affordance perspectives, and/or 2) use a greatly simpler approach by only surveying

the teachers regarding their affordance perceptions (and perhaps focusing on qualitative perceptions); this simpler approach may be more suited to situations with less/limited time, money, and other resources needed to conduct such as study.

The study principles, approach, and methodology is not strictly "nature-based" or environmental educationally focused (as is the case in many other school-ground studies and setting design efforts), thus this study approach and methodology may have "transferability" to other contexts and settings, especially those with an (quasi)-educational function or mission whether using an integrated instruction approach or not, including those in more densely built-up, urban locations. The use of the study approach and methodology, coupled with an understanding of the behavior setting and setting affordance theories and practices of Moore and Wong, and Broda, may also "afford" transferability of the study approach to non-educational settings. Likewise, the study approach and information may be transferable and useful for designers, and teacher's and administrators, seeking to re-design schoolgrounds (or other settings), to create sites and settings better designed for the teaching, learning, and experiential program elements as intended/envisioned.

Research Limitations

The findings and opportunities of this study are specific to Highlands elementary school, based on the study period, the conditions of the settings and institution (its ITI approach, teachers, and principal) at that time, and the teachers' survey participation. It was anticipated that not all teachers would complete the entire survey (for example, 19 teachers responded to "Question 4," and 10 teachers to questions 5 through 15 regarding Literary Park); given the interpretative nature of this study, 12 to 15 completed surveys was determined to be an adequate sample to illuminate and interpret data and major themes of the teachers' perceptions of the settings' ITI affordances.

The limited survey participation, and its limited quantity of survey data, while minimally adequate, also limited larger inferences that could be drawn from the statistical analysis.

CHAPTER 7: BIBLIOGRAPHY

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CHAPTER 8: APPENDICES

APPENDIX 1. CURRICULA STRANDS, SUBSTRANDS, AND BENCHMARKS

The expert judgment ratings were based on rating the affordance attributes of each settings' elements curriculum and lesson activity component using select strands, substrands, and benchmarks, selected from state, Edina Public Schools, and Highlands elementary curriculum and lesson activity standards and guidelines. They are summarized below.

Curriculum Strands *(S)*, Substrands *(sS)*, Standards, Benchmarks *(B)*, grades 1 through 5.

Science:
(S) Nature and Science of Engineering, (sS) Practice of Science, (B) encompassed standards and benchmarks related to understanding science, scientific inquiry and investigation, and working together in comparing and communicating.
(S) Nature and Science of Engineering, (sS) Practice of Engineering, (B) encompassed standards and benchmarks related to understanding engineering, the nature/human elements of engineering, and engineering design.
(S) Nature and Science of Engineering, (sS) Interactions, and STEM and Society, (B) encompassed standards and benchmarks related to understanding systems, both natural and designed, system components, and component and systems interactions, and the role of math and technology in Science and Engineering
(S) Physical Science, (sS) Physical Science, (B) encompassed standards and benchmarks related to understanding the properties and structure of matter, and natural and man-made elements
(S) Earth and Space Science, (sS) Earth Structure and Processes, (B) encompassed standards and benchmarks related to understanding the process of the change of earth's surfaces over time, sequences of changes of rocks and their material properties, the history and use of rocks, weather and climate, material and cycles for example the water cycle, the universe including the solar system and planets in motion, and human interactions with the environment.
(S) Life Science, and the Interdependence of Living Systems, (sS) Structure, Function of Living Systems, (B) encompassed standards and benchmarks related to understanding levels of organization and diversity, and ecosystems and ecosystem components.
(S) Life Science, and the Interdependence of Living Systems, (sS) Evolution, (B) encompassed standards and benchmarks related to understanding lifecyles, reproduction, changes of flora and fauna, and variation including its advantages and disadvantages.
(S) Life Science, and the Interdependence of Living Systems, (sS) Human Interactions, (B) encompassed standards and benchmarks related to understanding human/environment interactions, and related costs and benefits.

Health:
(sS) Food for Health and Fitness, (B) encompassed standards and benchmarks related to understanding bodily needs for food and water, sources of energy, identifying significant nutrients and their sources and functions, and expression of opinions regarding favorite foods, and showing examples of healthy lunch foods.

(sS) Growing and Learning, (B) encompassed standards and benchmarks related to understanding and describing body changes, identifying and exploring the five senses, and the importance of communication.
(sS) Being and Keeping Safe, (B) encompassed standards and benchmarks related to understanding identifying and demonstrating street crossing, emergencies and unexpected situations, and injuries, and responses, avoidance of threatening situations, safe play, and potential outdoor hazards.
(sS) Staying Fit and Healthy, (B) encompassed standards and benchmarks related to understanding, identifying and demonstrating injuries, the effects of littering, rules of safe play, the importance of the three "R's" and brainstorming ways to make home and school healthier environments.

Social Studies:
(S) Geography, (sS) Concepts of Location, (B) encompassed standards and benchmarks related to creation and use of drawings to show/describe spatial information and dimensions, addresses to identify place, locations relative to landmarks; the creation and use of sketch and mental maps to organize spatial information and describe familiar places; and the creation of simple maps and tools in real places like the school.
(S) Geography, (sS) Places and Regions, (B) encompassed standards and benchmarks related to identifying and describing settings in stories and places using physical and human characteristics, and human feature boundaries.
(S) Geography, (sS) Human/Environment Interactions, (B) encompassed standards and benchmarks related to identifying and understanding the physical and environmental influences of human activities and creation and use of maps that describe economic activities and resources and relationships.
(S) Geography, (sS) Government and Citizenships, (B) encompassed standards and benchmarks related to identifying and understanding the purpose and structure of governments including basic functions and differences.

Inquiry, and Sensory Faculties, grades 1 through 5.

Student Inquiry, based on Gardner's Multiple Intelligences: Inquiry affordances were structured based on the Gardner's' eight intelligences:
"linguistic" (word smart), ***"logical"*** (mathematical-number/reasoning)
"spatial" (picture and space/relationships), ***"bodily/kinesthetic"*** (movement)
"musical," "interpersonal" (people), **"intrapersonal"** (self)
"naturalistic" (nature smart regarding plants, animals, environmental aspects).

Teaching that Uses Students' Senses, and Sensory Richness: Identification and evaluation of potential affordances was based on the sensory faculties of hearing, taste, touch, smell, visual/seeing, thermal/temperature, humidity, time/space, and vestibular (gravity and position). The natural phenomena affordances of elements and their sensory faculties were considered in combination with the faculty itself, and included:
Hearing; for example the ability to sense levels of quietness/noisiness, and calmness of wind.
Taste; the range of taste from sweet to sour.
Touch; smooth to rough to sharp, hot to cold, calm to windy.
Smell; sweet to sour, strong to mild.
Sight/See; bright or dark, colors, sun and shadow, calm to windy, day and night.

Temperature/thermal; hot to cold, day and night.
Humidity; humid/moist to dry.
Time/Space; from the past to now to the future, inside and outside and edge, and top and bottom, and boundaries.
Vestibular or gravity/position; up/down, above/below, left/right.

APPENDIX 1A. EXPERT JUDGMENT SETTINGS DATA SPREADSHEETS.

Literary Park: Settings Data Spreadsheet; with expert judgment Ratings for Science and Health Curriculi.

BEHAVIOR SETTINGS			Curriculum and Lesson Activities														
AND TEACHERS' PERCEPTIONS			Science														
OF ITI AFFORDANCES																	
HIGHLANDS ELEMENTARY		EXPERT	Nature of Science & Engineering							Physical Science		Earth and Space Science					
SCHOOLGROUNDS		JUDGEMENT	Practice of Sci		Practice of Eng		Interactions; STEMSoc			Physical Science		Earth Structure & Processes					
LITERARY PARK Setting	Elements RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high	Understand Science, work together, communicate	Scientific Inquiry; investigation	Understand Engineering, nature/human	Engineering design	Systems, natural-designed, components, interaction	Math & Tech in Sci & Eng		Mater: Properties & Structure		Changing Surfaces, processes, time	Rock sequences, material properties, use, history	Weather & climate	Materials cycles ie water cycle	Universe: solar system, motion	Human interactions w Environ
Plan, Design; Elements, Characteristics		Key Setting Elements															
Mix of Types of Elements	Biotic	water															
	also in 'other organisms'	trees -edge 8, int 4, 1 shade, shrubs 1				1				3			2				
		perennials/wildflowers															
		herbs/produce															
		turf/grass -worn				1				1			1				
	Abiotic	water															
	some in 'loose parts'	soil / dirt, in worn turf				1				1			1				
	Found	nests?															
		nooks and crannies															
		drain pipes / outlets															
	Built	gardens															
	some in 'fixed features'	class circles/seating				4				4			4				
		bird/animal houses															
		pond / streambed															
		wind devices/chimes															
		pavers/step stones															
		forts/shelters/lookouts															
		gather/meeting places (2)				3				3			3				
		stages; informal benches, rocks				2				2			2				
		storage / field station															
Choice, assembly of elements	*Fixed Features*																
	some in 'built'	entrances, semi-defined				1				1			2				
		pathways															
		signs/displays, limited on rock				1				1			1				
		landforms/topo															
		open area, semi-open				1				1			1				
		fences/enclosures, edge; 1 maple tree canopy				1				1			1				
		surfacing -woodchips				2				2			2				
		benches / sitting features				2				3			3				
		art bench				2				3			3				
		manu play equipment															
		multipurpose/games															
		water spigots / hoses															
	Loose Parts	small rocks -very few				1				1			2				
		logs / trees															
		play props															
	Populations	*People (potential)*															
		Individual				3				3			3				
		Pair				4				4			4				
		Group/Team 3+				5				5			5				
		Class				4				4			4				
		Organisms (exist, potential)															
		mammals, lessor/exposed				1				1			1				
		birds, lessor veg diversity				3				2			1				
		insects, lessor, not diverse				2				1			1				
		fish / aquatic															
		amphibians, lessor, not diverse				1				1			1				
		reptiles, lessor, not diverse				1				1			1				
		farm / domestic															
Setting Diversity						**47**				**49**			**49**				
Based on having Elements in all Categories																	
Number and types of Elements in Categories		hand sum															
updated 121217																	
only had sum numbers are correct at bottom																	

| | | |

Literary Park: Settings Data Spreadsheet; with expert judgment Ratings for Social Studies Curriculum, Student Inquiry based on Gardner's Multiple Intelligences, and Sensory Faculties.

BEHAVIOR SETTINGS									
AND TEACHERS' PERCEPTIONS									
OF ITI AFFORDANCES			Social Studies						
HIGHLANDS ELEMENTARY		EXPERT	Geography						
SCHOOLGROUNDS		JUDGEMENT	oncepts of Location			Places and Regions	Human Env Interaction	't and Citizen	
LITERARY PARK Setting	Elements RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high	*create/use drawings to show-describe spatial info-dimensions, address to identify place, location relative to landmark*	*create, use sketch maps-Mental maps org spatial info, describe familiar place,*	*create, interpret simple maps tools real places ie school*	*identify, describe settings in stories/places using phys/human characteristics, human feature boundaries*	*Phys env influences human activities use maps describe econ activities and resources relations*	*explain govt purpose-basic-diff functions*	
Plan, Design; Elements, Characteristics		Key Setting Elements							
Mix of Types of Elements	**Biotic**	water							
	also in 'other organisms'	trees -edge 8, int 4, 1 shade, shrubs 1		2		2	2	1	
		perennials/wildflowers							
		herbs/produce							
		turf/grass -worn		2		1	1	1	
	Abiotic	sand							
	some in 'loose parts'	soil / dirt, in worn turf		1		1	1	1	
	Found	nests?							
		nooks and crannies							
		drain pipes / outlets							
	Built	gardens							
	some in 'fixed features'	class circles/seating		4		4	4	4	
		bird/animal houses							
		pond / streambed							
		wind devices/chimes							
		pavers/step stones							
		forts/shelters/lookouts							
		gather/meeting places (2)		3		3	3	3	
		stages; informal benches, rocks		2		2	3	2	
		storage / field station							
Choice, assembly of elements	***Fixed Features***								
	some in 'built'	entrances, semi-defined		2		1	2	1	
		pathways							
		signs/displays, limited on rock		1		1	1	1	
		landforms/topo							
		open area, semi-open		1		1	1	1	
		fences/enclosures, edge; 1 maple tree canopy		2		2	2	1	
		surfacing -woodchips		1		1	2	2	
		benches / sitting features		2		2	2	3	
		art bench		3?		2	2	3?	
		manu play equipment							
		multipurpose/games							
		water spigots / hoses							
	Loose Parts	small rocks -very few		1		1	1	2	
		logs / trees							
		play props							
	Populations	*People (potential)*							
		Individual		3		3	3	3	
		Pair		4		4	4	4	
		Group/Team 3+		5		5	5	5	
		Class		4		4	4	4	
		Organisms (exist, potential)							
		mammals, lessor/exposed		1		1	1	1	
		birds, lessor veg diversity		1		2	1	1	
		insects, lessor, not diverse		1		1	1	1	
		fish / aquatic							
		amphibians, lessor, not diverse		1		1	1	1	
		reptiles, lessor, not diverse		1		1	1	1	
		farm / domestic							
Setting Diversity			**0**	**45**	**0**	**46**	**48**	**44**	
Based on having Elements in all Categories									
Number and types of Elements in Categories		hand sum							
updated 121217									
only had sum numbers are correct at bottom									

Inquiry																				
Inquiry via 8 Intelligences																				
SOC STUDIES									**INQUIRY**											**SENSORY**
AVERAGE									AVERAGE											AVERAGE
	Linguistic-word smart	*Logical-mathematical-number/reasoning*	*Spatial-picture*	*Movement bodily* Kinesthetic limb-joint*	*Musical*	*Interpersonal-people*	*Intrapersonal-self*	*Naturalistic-nature smart*		*Hearing*	*Taste*	*Touch*	*Smell*	*See*	*Tempature-thermal*	*Humidity*	*Time-Space*	*Vestibular garvity-position*		
										quiet/noisy calm/windy	sweet/ sour	smooth/r ough, hot/cool	sweet/s our	bright/dark, colors, sun/shadow,	hot/cool day/nig ht	humid/ dry	past/now/fu ture, inside/outsi	up/down, above/below, left/right		
2	3	2	2	2	2	2	2	3	2	2	1	3	1	3	3	1	3	2	2	
1	1	1	1	2	1	1	1	2	1	1	1	2	3	1	2	3	2	1	2	
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
4	4.0	4.0	5.0	3.0	2.0	3.0	2.0	2.0	3	3.0	2.0	3.0	2.0	3.0	2.0	1.0	2.0	2.0	2	
3	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3	3.0	2.0	4.0	2.0	1.0	2.0	1.0	1.0	2.0	2	
2	2.0	2.0	3.0	3.0	2.0	3.0	2.0	2.0	2	2.0	2.0	2.0	2.0	1.0	1.0	1.0	2.0	2.0	2	
2	1	2	3	2	1	2	1	1	2	1	1	2	1	1	1	1	2	3	1	
1	2	2	2	1	1	2	2	2	2	1	1	2	1	1	2	1	1	1	1	
1	1	1	2	3	1	2	2	2	2	1	1	1	1	1	1	1	2	1	1	
2	1	1	3	2	1	2	2	1	2	1	1	1	1	2	1	1	3	2	1	
2	1	2	1	2	1	1	1	2	1	2	1	3	2	1	2	1	2	1	2	
2	3	3	3	3	3	3	3	3	3	3	1	3	2	2	2	1	1	3	2	
2	3	3	3	3	3	3	3	3	3	3	1	3	2	2	2	1	2	3	2	
1	2	1	1	2	1	2	1	2	2	1	1	2	1	2	2	1	1	1	1	
3	3	3	3	3	3	3	3	3	3	3	1	2	2	3	2	1	3	3	2	
4	4	4	4	4	4	4	4	4	4	3	1	2	2	3	2	1	3	3	2	
5	5	5	5	5	5	5	5	5	5	3	1	2	2	3	2	1	3	3	2	
4	4	4	4	4	4	4	4		4	3	1	2	2	3	2	1	3	3	2	
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
										1	1	1	1	1	1	1	1	1		
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
1	1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	1	1	
47	49	49	54	53	44	51	47	52	50	43	27	46	36	40	38	26	43	43	37	
47									50										35	

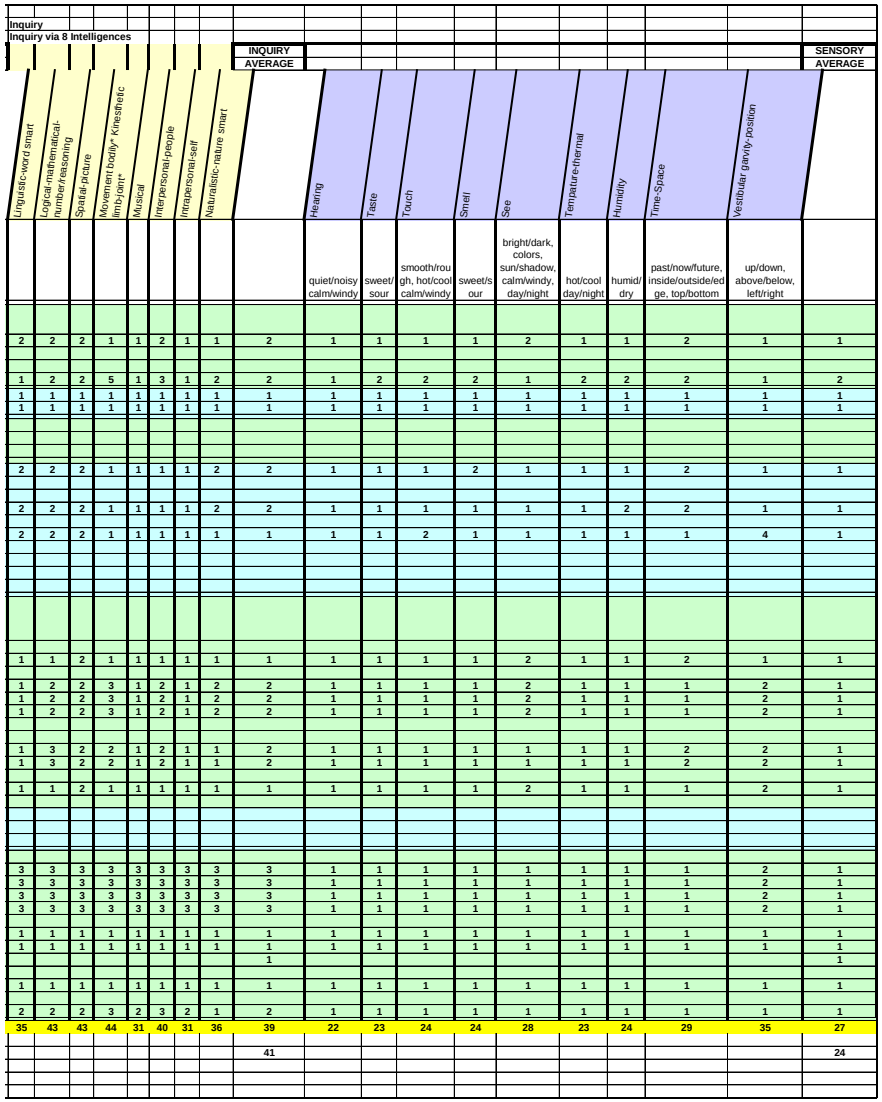
East Lawn: Settings Data Spreadsheet; with expert judgment Ratings for Science and Health Curriculi.

| BEHAVIOR SETTINGS | | |

| | | |

East Lawn: Settings Data Spreadsheet; with expert judgment Ratings for Social Studies Curriculum, Student Inquiry based on Gardner's Multiple Intelligences, and Sensory Faculties.

BEHAVIOR SETTINGS									
AND TEACHERS' PERCEPTIONS									
OF ITI AFFORDANCES			Social Studies						
HIGHLANDS ELEMENTARY		EXPERT	Geography						SOC STUDIES
SCHOOLGROUNDS		JUDGEMENT	Concepts of Location			Places and Regions	*Human Env Interaction*	Gov't and Ci	AVERAGE
EAST LAWN Setting	Elements RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high	*create/use drawings to show-describe spatial info-dimensions, address to identify place, location relative to landmark*	*create, use sketch maps-Mental maps org spatial info, describe familiar place,*	*create, interpret simple maps tools real places te school*	*Identify, describe settings in stories/films/etc using phys/human characteristics, human feature boundaries*	*Phys env influences human activities use maps describe economic activities and resources relations*	*explain gov't purpose-basic-diff functions*	
Plan, Design; Elements, Characteristics		Key Setting Elements							
Mix of Types of Elements	**Biotic**	water							
	also in 'other organisms'	trees, at edge, few large shrubs		1		2	1	1	1
		perennials/wildflowers							
		herbs/produce							
		mostly turf/grass, a few wet spots		2		2	2	1	2
	Abiotic	sand, little at edge		1		1	1	1	1
	some in 'loose parts'	soil / dirt, little at worn areas		1		1	1	1	1
	Found	nests							
		nooks and crannies							
		drain pipes / outlets -none found							
	Built	view of gardens		2		2	2	2	2
	some in 'fixed features'	class circles/seating							
		bird/animal houses							
		streambed, lessor, edge		2		2	1	2	2
		wind devices/chimes							
		pavers/step logs, lessor, edge		2		2	1	1	2
		forts/shelters/lookouts							
		gather/meeting places							
		stages							
		storage / field station							
Choice, assembly of elements	***Fixed Features***								
	some in 'built'	entrances							
		pathways/sidewalk edge		1		1	1	1	1
		signs / displays							
		landforms/topo; turf swale edge		2		1	2	1	2
		open area		2		1	2	1	2
		fences/enclosures, hidden in edge large shrubs		2		1	2	1	2
		surfacing/ground cover							
		benches / sitting features							
		view of manu play equip, edge		2		2	2	2	2
		multipurpose/games; baseball backstop, homeplate area		2		2	2	2	2
		water spigots / hoses							
		light at edge		1		1	1	1	1
	Loose Parts	rocks / stone							
		logs / trees							
		play props							
	Populations	*People (potential)*							
		Individual		3		3	3	3	3
		Pair		3		3	3	3	3
		Group/Team 3+		3		3	3	3	3
		Class		3		3	3	3	3
		Organisms (exist, potential)							
		mammals, very limited		1		1	1	1	1
		birds, very limited		1		1	1	1	1
		insects							1
		fish / aquatic							
		amphibians, very limited		1		1	1	1	1
		reptiles							
		farm / domestic (potential)		1		1	1	1	1
			0	39	0	37	37	34	38
Setting Diversity									
Based on having Elements in all Categories		hand sum							40
Number and types of Elements in Categories									
updated 121217									
only hand sum numbers are correct at bottom									



Inquiry																		
Inquiry via 8 Intelligences																		
								INQUIRY AVERAGE										SENSORY AVERAGE
Linguistic-word smart	Logical-mathematical-number/reasoning	Spatial-picture	Movement bodily* Kinesthetic limb/joint	Musical	Interpersonal-people	Intrapersonal-self	Naturalistic--nature smart		Hearing	Taste	Touch	Smell	See	Temprature-thermal	Humidity	Time-Space	Vestibular gravity-position	
									quiet/noisy calm/windy	sweet/ sour	smooth/rough, hot/cool calm/windy	sweet/sour	bright/dark, colors, sun/shadow, calm/windy, day/night	hot/cool day/night	humid/ dry	past/now/future, inside/outside/edge, top/bottom	up/down, above/below, left/right	
2	2	2	1	1	2	1	1	2	1	1	1	1	2	1	1	2	1	1
1	2	2	5	1	3	1	2	2	1	2	2	2	1	2	2	2	1	2
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	1	1	1	1	2	2	1	1	1	2	1	1	1	2	1	1
2	2	2	1	1	1	1	2	2	1	1	1	1	1	1	2	2	1	1
2	2	2	1	1	1	1	1	1	1	1	2	1	1	1	1	1	4	1
1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	2	1	1
1	2	2	3	1	2	1	2	2	1	1	1	1	2	1	1	1	2	1
1	2	2	3	1	2	1	2	2	1	1	1	1	2	1	1	1	2	1
1	2	2	3	1	2	1	2	2	1	1	1	1	2	1	1	1	2	1
1	3	2	2	1	2	1	1	2	1	1	1	1	1	1	1	2	2	1
1	3	2	2	1	2	1	1	2	1	1	1	1	1	1	1	2	2	1
1	1	2	1	1	1	1	1	1	1	1	1	1	2	1	1	1	2	1
3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	2	1
3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	2	1
3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	2	1
3	3	3	3	3	3	3	3	3	1	1	1	1	1	1	1	1	2	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
								1										1
1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
2	2	2	3	2	3	2	1	2	1	1	1	1	1	1	1	1	1	1
35	43	43	44	31	40	31	36	39	22	23	24	24	28	23	24	29	35	27
								41										24

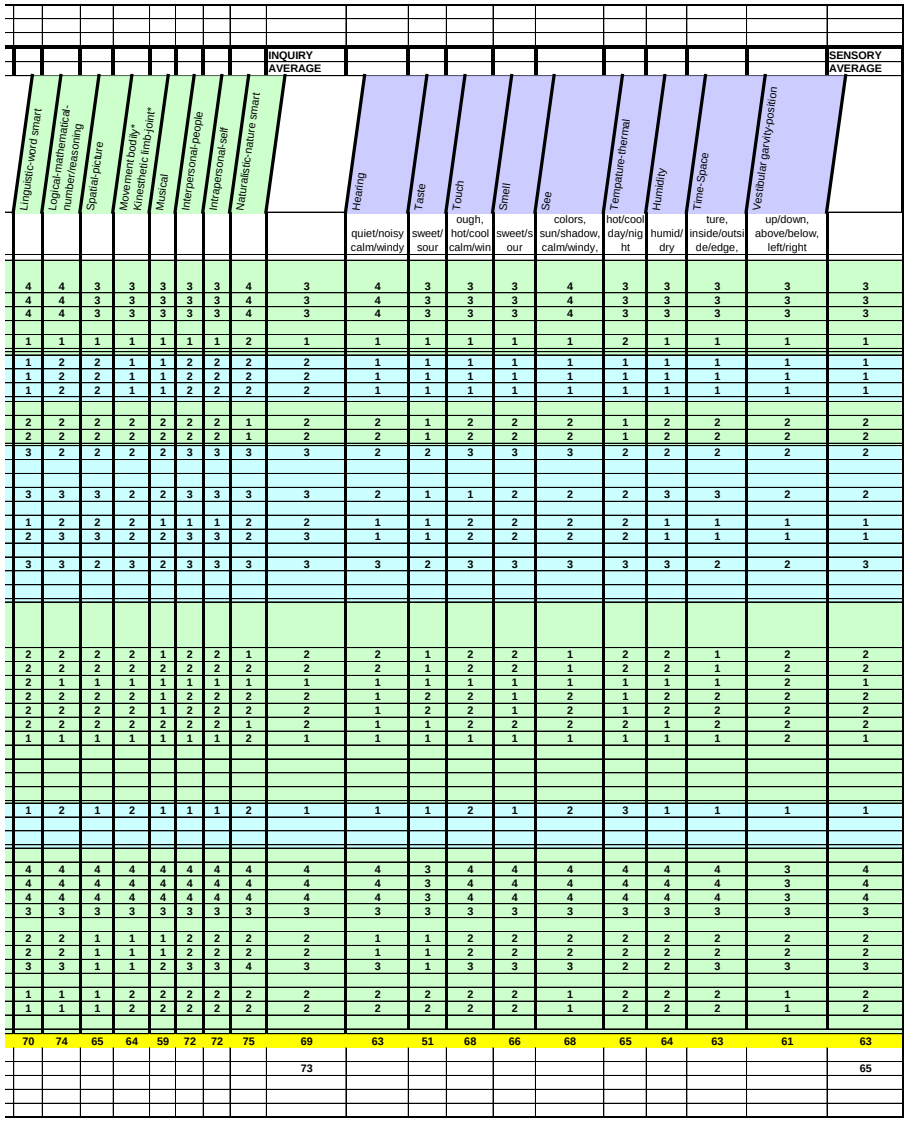
Raingarden: Settings Data Spreadsheet; with expert judgment Ratings for Science and Health Curriculi.

BEHAVIOR SETTINGS AND TEACHERS' PERCEPTIONS OF ITI AFFORDANCES HIGHLANDS ELEMENTARY SCHOOLGROUNDS		EXPERT JUDGEMENT	Curriculum Science Nature of Science & Engineering Practice of Sci		Practice of Eng		Interactions; STEMSoc		Physical Science Physical Science		Earth and Space Science Earth Structure & Processes						
RAINGARDEN Setting	Elements Affordances RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high	Understand Science, work together, communicate	Scientific Inquiry, Investigation	Understand Engineering, nature/human	Engineering design	Systems, natural-designed, components, interaction	Math & Tech in Sci & Eng	Matter: Properties & Structure		Changing surfaces, processes, time	Rock sequences, material properties, use, history	Weather & climate	Materials cycles ie water cycle	Universe: solar system, motion	Human Interactions w Environ	
Plan, Design; Elements, Characteristics		Key Setting Elements															
Mix of Types of Elements	Biotic also in 'other organisms'	water; intermitent, large vol, ponding				4			4				4				
		two trees, edge many small shrubs				4			4				4				
		perennials/wildflowers; many, edge, some diversity				4			4				4				
		herbs/produce?															
		turf/grass; edge-some worn				2			1				1				
	Abiotic some in 'loose parts'	sand; in swale bottom				1			2				2				
		soil / dirt; in under shrubs grasses etc				1			2				2				
		some stone in swale, rip rap at CB inlet				1			2				2				
	Found	nests; some?															
		nooks/crannies, limited nr shrubs wood walks				2			2				1				
		drain pipes / CB inlet, outlet				4			3				3				
	Built some in 'fixed features'	gardens; rain, native plants				4			3				4				
		class circles/seating															
		bird/animal houses?															
		pond; limited visible leaf-off, and streambed				3			2				3				
		wind devices/chimes?															
		pavers/step stones; few edge and mid swale				2			3				3				
		curb edge at CB-end				3			3				3				
		forts/shelters/lookouts															
		gather/meet places; small, edge, swale, woodplanks, CB				3			3				3				
		stages															
		storage / field station															
Choice, assembly of elements	*Fixed Features* some in 'built'	entrances; end, woodplank crossings				2			2				2				
		pathways; wooden plank crossings 2				2			2				2				
		signs / displays; 1, edu limited				2			2				2				
		landforms/topo; minor swale, edge				2			2				2				
		open area, limited swale, area around				2			2				2				
		fences/enclosures; limited, W-end split rail, few wire edges				2			2				2				
		ground cover; limited, informal				2			2				2				
		benches / sitting features															
		manu play equipment															
		multipurpose/games															
		water spigots / hoses?															
	Loose Parts	rocks / stone rip rap nr CB and fence; informal				2			2				2				
		logs / trees															
		play props															
	Populations	*People (potential)*															
		Individual				4			3				4				
		Pair				4			4				4				
		Group/Team 3+				4			4				4				
		Class; somewhat limited				3			3				3				
		Organisms (exist/potential)															
		mammals; some, limited				2			2				2				
		birds; some, veg diversity				2			2				2				
		insects; yes, veg diversity				3			2				2				
		fish / aquatic; limited aquatic															
		amphibians, some, intermittent				2			2				1				
		reptiles; some, intermittent				2			2				1				
		farm / domestic															
						80			78				78				
Setting Diversity																	
Based on having Elements in all Categories		hand sum															
Number and types of Elements in Categories																	
updated 121217																	
only hand sum numbers are correct at bottom																	

| | | |

Raingarden: Settings Data Spreadsheet; with expert judgment Ratings for Social Studies Curriculum, Student Inquiry based on Gardner's Multiple Intelligences, and Sensory Faculties.

BEHAVIOR SETTINGS									
AND TEACHERS' PERCEPTIONS									
OF ITI AFFORDANCES			Social Studies						
HIGHLANDS ELEMENTARY		EXPERT	Geography						SOC STUDIES
SCHOOLGROUNDS		JUDGEMENT	Concepts of Location			Places and Regions	Human Env Interaction	Gov't and Ci	AVERAGE
RAINGARDEN Setting	Elements Affordances RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high	create/use drawings to show-describe spatial info-dimensions, place, address to identify place, location relative to landmark	create, use sketch maps-Mental maps org spatial info, describe familiar place.	create, interpret simple maps tools real places ie school	identify, describe settings in stories/places using phys/human characteristics, human feature boundaries	Phys env influences human activities use maps describe econ activities and resources relations	explain gov't purpose-basic-diff functions	
Plan, Design; Elements, Characteristics		Key Setting Elements							
Mix of Types of Elements	Biotic	water; intermitent, large vol, ponding		4		3	3	3	3
	also in 'other organisms'	two trees, edge many small shrubs		2		2	2	2	2
		perennials/wildflowers; many, edge, some diversity		3		2	3	2	3
		herbs/produce?							
		turf/grass; edge-some worn		1		1	2	1	1
	Abiotic	sand; in swale bottom		1		1	1	1	1
	some in 'loose parts'	soil / dirt; in under shrubs grasses etc		1		1	1	1	1
		some stone in swale, rip rap at CB inlet		1		1	1	1	1
	Found	nests; some?							
		nooks/crannies, limited nr shrubs wood walks		2		1	1	1	1
		drain pipes / CB inlet, outlet		2		1	1	1	1
	Built	gardens; rain, native plants		3		2	2	2	2
	some in 'fixed features'	class circles/seating							
		bird/animal houses?							
		pond; limited visible leaf-off, and streambed		3		3	3	3	3
		wind devices/chimes?							
		pavers/step stones; few edge and mid swale		2		1	2	1	2
		curb edge at CB-end		2		1	2	1	2
		forts/shelters/lookouts							
		gather/meet places; small, edge, swale, woodplanks, CB		2		2	2	2	2
		stages							
		storage / field station							
Choice, assembly of elements	*Fixed Features*								
	some in 'built'	entrances; end, woodplank crossings		1		1	1	1	1
		pathways; wooden plank crossings 2		1		1	1	1	1
		signs / displays; 1, edu limited		1		1	1	1	1
		landforms/topo; minor swale, edge		1		1	1	1	1
		open area, limited swale, area around		1		1	1	1	1
		fences/enclosures; limited, W-end split rail, few wire edges		1		1	1	1	1
		ground cover; limited, informal		1		1	1	1	1
		benches / sitting features							
		manu play equipment							
		multipurpose/games							
		water spigots / hoses?							
	Loose Parts	rocks / stone rip rap nr CB and fence; informal		2		1	1	1	1
		logs / trees							
		play props							
	Populations	*People (potential)*							
		Individual		3		3	3	3	3
		Pair		3		3	3	3	3
		Group/Team 3+		3		3	3	3	3
		Class; somewhat limited		3		3	3	3	3
		Organisms (exist/potential)							
		mammals; some, limited		2		2	1	2	2
		birds; some, veg diversity		2		2	1	2	2
		insects; yes, veg diversity		2		2	1	2	2
		fish / aquatic; limited aquatic							
		amphibians, some, intermittent		2		1	1	1	1
		reptiles; some, intermittent		2		1	1	1	1
		farm / domestic							
			0	60	0	50	51	50	53
Setting Diversity									
Based on having Elements in all Categories		hand sum							53
Number and types of Elements in Categories									
updated 121217									
only hand sum numbers are correct at bottom									



								INQUIRY AVERAGE											SENSORY AVERAGE
Linguistic-word smart	Logical-mathematical-number/reasoning	Spatial-picture	Movement bodily-Kinesthetic limb-joint	Musical	Interpersonal-people	Intrapersonal-self	Naturalistic-nature smart		Hearing	Taste	Touch	Smell	See	Tempature-thermal	Humidity	Time-Space	Vestibular garvity-position	
									quiet/noisy calm/windy	sweet/ sour	ough, hot/cool calm/win	sweet/s our	colors, sun/shadow, calm/windy,	hot/cool day/nig ht	humid/ dry	ture, inside/outsi de/edge,	up/down, above/below, left/right	
4	4	3	3	3	3	3	4	3	4	3	3	3	4	3	3	3	3	3
4	4	3	3	3	3	4		3	4	3	3	3	4	3	3	3	3	3
4	4	3	3	3	3	3	4	3	4	3	3	3	4	3	3	3	3	3
1	1	1	1	1	1	1	2	1	1	1	1	1	1	2	1	1	1	1
1	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1
1	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1
1	2	2	1	1	2	2	2	2	1	1	1	1	1	1	1	1	1	1
2	2	2	2	2	2	2	1	2	2	1	2	2	2	1	2	2	2	2
2	2	2	2	2	2	2	1	2	2	1	2	2	2	1	2	2	2	2
3	2	2	2	2	3	3	3	3	2	2	3	3	3	2	2	2	2	2
3	3	3	2	2	3	3	3	3	2	1	1	2	2	2	3	3	2	2
1	2	2	2	1	1	1	2	2	1	1	2	2	2	2	1	1	1	1
2	3	3	2	2	3	3	2	3	1	1	2	2	2	2	1	1	1	1
3	3	2	3	2	3	3	3	3	3	2	3	3	3	3	3	2	2	3
2	2	2	2	1	2	2	1	2	2	1	2	2	1	2	2	1	2	2
2	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	1	2	2
2	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	2	1
2	2	2	2	1	2	2	2	2	1	2	2	1	2	1	2	2	2	2
2	2	2	2	1	2	2	2	2	1	2	2	1	2	1	2	2	2	2
2	2	2	2	2	2	2	1	2	1	1	2	2	2	2	1	2	2	2
1	1	1	1	1	1	1	2	1	1	1	1	1	1	1	1	1	2	1
1	2	1	2	1	1	1	2	1	1	1	2	1	2	3	1	1	1	1
4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	3	4
4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	3	4
4	4	4	4	4	4	4	4	4	4	3	4	4	4	4	4	4	3	4
3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3	3
2	2	1	1	1	2	2	2	2	1	1	2	2	2	2	2	2	2	2
2	2	1	1	1	2	2	2	2	1	1	2	2	2	2	2	2	2	2
3	3	1	1	2	3	3	4	3	3	1	3	3	3	2	2	3	3	3
1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2
1	1	1	2	2	2	2	2	2	2	2	2	2	1	2	2	2	1	2
70	74	65	64	59	72	72	75	69	63	51	68	66	68	65	64	63	61	63
								73										65

Settings Data Spreadsheets; with expert judgment individual ratings as summarized and mean scores calculated for ITI Curriculum and Lesson Activity components at each setting.

BEHAVIOR SETTINGS AND TEACHERS' PERCEPTIONS OF ITI AFFORDANCES							
HIGHLANDS ELEMENTARY SCHOOLGROUNDS		EXPERT JUDGEMENT	SCIENCE AVERAGE	HEALTH AVERAGE	SOC STUDIES AVERAGE	INQUIRY AVERAGE	SENSORY AVERAGE
LITERARY PARK Setting	Elements RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high					
Plan, Design; Elements, Characteristics		Key Setting Elements					
Mix of Types of Elements	Biotic	water					
	also in 'other organisms'	trees -edge 8, int 4, 1 shade, shrubs 1	2	2	2	2	2
		perennials/wildflowers					
		herbs/produce					
		turf/grass -worn	1	1	1	1	2
	Abiotic	sand					
	some in 'loose parts'	soil / dirt, in worn turf	1	1	1	1	1
	Found	nests?					
		nooks and crannies					
		drain pipes / outlets					
	Built	gardens					
	some in 'fixed features'	class circles/seating	4	4	4	3	2
		bird/animal houses					
		pond / streambed					
		wind devices/chimes					
		pavers/step stones					
		forts/shelters/lookouts					
		gather/meeting places (2)	3	3	3	3	2
		stages; informal benches, rocks	2	2	2	2	2
		storage / field station					
Choice, assembly of elements	Fixed Features						
	some in 'built'	entrances, semi-defined	1	1	2	2	1
		pathways					
		signs/displays, limited on rock	1	1	1	2	1
		landforms/topo					
		open area, semi-open	1	1	1	2	1
		fences/enclosures, edge; 1 maple tree canopy	1	2	2	2	1
		surfacing -woodchips	2	1	2	1	2
		benches / sitting features	2	2	2	3	2
		art bench	2	2	2	3	2
		manu play equipment					
		multipurpose/games					
		water spigots / hoses					
	Loose Parts	small rocks -very few	1	1	1	2	1
		logs / trees					
		play props					
	Populations	People (potential)					
		Individual	3	3	3	3	2
		Pair	4	4	4	4	2
		Group/Team 3+	5	5	5	5	2
		Class	4	4	4	4	2
		Organisms (exist, potential)					
		mammals, lessor/exposed	1	1	1	1	1
		birds, lessor veg diversity	2	1	1	1	1
		insects, lessor, not diverse	1	1	1	1	1
		fish / aquatic					
		amphibians, lessor, not diverse	1	1	1	1	1
		reptiles, lessor, not diverse	1	1	1	1	1
		farm / domestic					
Setting Diversity			48	44	47	50	37
Based on having Elements in all Categories							
Number and types of Elements in Categories		hand sum	46	45	47	50	35
updated 121217							
only had sum numbers are correct at bottom							

BEHAVIOR SETTINGS AND TEACHERS' PERCEPTIONS OF ITI AFFORDANCES							
HIGHLANDS ELEMENTARY SCHOOLGROUNDS		EXPERT JUDGEMENT	SCIENCE AVERAGE	HEALTH AVERAGE	SOC STUDIES AVERAGE	INQUIRY AVERAGE	SENSORY AVERAGE
EAST LAWN Setting	Elements RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high					
Plan, Design; Elements, Characteristics		Key Setting Elements					
Mix of Types of Elements	Biotic	water					
	also in 'other organisms'	trees, at edge, few large shrubs	1	1	1	2	1
		perennials/wildflowers					
		herbs/produce					
		mostly turf/grass, a few wet spots	2	2	2	2	2
	Abiotic	sand, little at edge	1	1	1	1	1
	some in 'loose parts'	soil / dirt, little at worn areas	1	1	1	1	1
	Found	nests					
		nooks and crannies					
		drain pipes / outlets -none found					
	Built	view of gardens	1	2	2	2	1
	some in 'fixed features'	class circles/seating					
		bird/animal houses					
		streambed, lessor, edge	2	2	2	2	1
		wind devices/chimes					
		pavers/step logs, lessor, edge	2	2	2	1	1
		forts/shelters/lookouts					
		gather/meeting places					
		stages					
		storage / field station					
Choice, assembly of elements	Fixed Features						
	some in 'built'	entrances					
		pathways/sidewalk edge	1	1	1	1	1
		signs / displays					
		landforms/topo; turf swale edge	1	1	2	2	1
		open area	1	1	2	2	1
		fences/enclosures, hidden in edge large shrubs	1	1	2	2	1
		surfacing/ground cover					
		benches / sitting features					
		view of manu play equip, edge	2	2	2	2	1
		multipurpose/games; baseball backstop, homepla	2	3	2	2	1
		water spigots / hoses					
		light at edge	2	2	1	1	1
	Loose Parts	rocks / stone					
		logs / trees					
		play props					
	Populations	People (potential)					
		Individual	3	3	3	3	1
		Pair	3	3	3	3	1
		Group/Team 3+	3	3	3	3	1
		Class	3	3	3	3	1
		Organisms (exist, potential)					
		mammals, very limited	1	1	1	1	1
		birds, very limited	1	1	1	1	1
		insects	1	1	1	1	1
		fish / aquatic					
		amphibians, very limited	1	1	1	1	1
		reptiles					
		farm / domestic (potential)	1	1	1	2	1
			36	37	38	39	27
Setting Diversity							
Based on having Elements in all Categories		hand sum	36	39	40	41	24
Number and types of Elements in Categories							
updated 121217							
only hand sum numbers are correct at bottom							

BEHAVIOR SETTINGS							
AND TEACHERS' PERCEPTIONS							
OF ITI AFFORDANCES							
HIGHLANDS ELEMENTARY		EXPERT	SCIENCE	HEALTH	SOC STUDIES	INQUIRY	SENSORY
SCHOOLGROUNDS		JUDGEMENT	AVERAGE	AVERAGE	AVERAGE	AVERAGE	AVERAGE
RAINGARDEN Setting	Elements Affordances RATED based on relative curriculum, inquiry, sensory affordance strengths	1 is low, 3 medium, 5 high					
Plan, Design; Elements, Characteristics		Key Setting Elements					
Mix of Types of Elements	**Biotic**	water; intermitent, large vol, ponding	4	3	3	3	3
	also in 'other organisms'	two trees, edge many small shrubs	4	2	2	3	3
		perennials/wildflowers; many, edge, son	4	3	3	3	3
		herbs/produce?					
		turf/grass; edge-some worn	1	1	1	1	1
	Abiotic	sand; in swale bottom	2	1	1	2	1
	some in 'loose parts'	soil / dirt; in under shrubs grasses etc	2	1	1	2	1
		some stone in swale, rip rap at CB inlet	2	1	1	2	1
	Found	nests; some?					
		nooks/crannies, limited nr shrubs wood	2	2	1	2	2
		drain pipes / CB inlet, outlet	3	2	1	2	2
	Built	gardens; rain, native plants	3	2	2	3	2
	some in 'fixed features'	class circles/seating					
		bird/animal houses?					
		pond; limited visible leaf-off, and stream	3	3	3	3	2
		wind devices/chimes?					
		pavers/step stones; few edge and mid s	2	1	2	2	1
		curb edge at CB-end	3	1	2	3	1
		forts/shelters/lookouts					
		gather/meet places; small, edge, swale	3	2	2	3	3
		stages					
		storage / field station					
Choice, assembly of elements	***Fixed Features***						
	some in 'built'	entrances; end, woodplank crossings	2	1	1	2	2
		pathways; wooden plank crossings 2	2	1	1	2	2
		signs / displays; 1, edu limited	2	1	1	1	1
		landforms/topo; minor swale, edge	2	1	1	2	2
		open area, limited swale, area around	2	1	1	2	2
		fences/enclosures; limited, W-end split	2	1	1	2	2
		ground cover; limited, informal	2	1	1	1	1
		benches / sitting features					
		manu play equipment					
		multipurpose/games					
		water spigots / hoses?					
	Loose Parts	rocks / stone rip rap nr CB and fence; ir	2	2	1	1	1
		logs / trees					
		play props					
	Populations	*People (potential)*					
		Individual	4	3	3	4	4
		Pair	4	4	3	4	4
		Group/Team 3+	4	4	3	4	4
		Class; somewhat limited	3	3	3	3	3
		Organisms (exist/potential)					
		mammals; some, limited	2	2	2	2	2
		birds; some, veg diversity	2	2	2	2	2
		insects; yes, veg diversity	3	2	2	3	3
		fish / aquatic; limited aquatic					
		amphibians, some, intermittent	2	1	1	2	2
		reptiles; some, intermittent	2	1	1	2	2
		farm / domestic					
			76	55	53	69	63
Setting Diversity							
Based on having Elements in all Categories		hand sum	80	57	53	73	65
Number and types of Elements in Categories							
updated 121217							
only hand sum numbers are correct at bottom							

APPENDIX 1B. TEACHERS' SETTINGS DATA SPREADSHEET.

Settings Data Spreadsheet; with Teachers' Survey Mean Summary Ratings of Curriculum and Lesson Activity Components inserted. Numbers in table are mean summary rating from teachers' survey. Note that "teachers' weighted Average Ratings" at the bottom of the table were not used in the final analysis and interpretation of the teachers' perceived affordances as curriculum and lesson activity component affordances "summary means;" Statistically-analyzed and derived "statistical summary means" were used for each component and activity at each setting instead.

BEHAVIOR SETTINGS			LITERARY PARK						EAST LAWN						RAINGARDEN					
AND TEACHERS' PERCEPTIONS				Curriculum		Lesson Activities				Curriculum		Lesson Activities				Curriculum		Lesson Activities		
OF ITI AFFORDANCES		TEACHERS	Science	Health	Social Studies				Science	Health	Social Studies				Science	Health	Social Studies			
HIGHLANDS ELEMENTARY			T	T	T	Inquiry	Sensory		T	T	T	Inquiry	Sensory		T	T	T	Inquiry	Sensory	
SCHOOLGROUNDS		Teachers elements on survey only				T	T					T	T					T	T	
Plan, Design; Elements, Characteristics		Key Setting Elements						ave						ave						ave
Mix of Types of Elements	Biotic	water	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA		4.0	2.8	3.5	4.2	3.6	3.6
	also in 'other organisms'	trees -edge, int, shade, shrubs	3.5	2.1	3.0	3.9	3.7	3.2	4.0	1.5	2.0	3.5	3.1	2.8	4.0	2.3	2.0	4.5	4.3	3.4
	existing	perennials/wildflowers	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA		4.2	3.0	3.7	4.0	4.4	3.9
		turf/grass-open grassy area	2.8	2.0	2.7	4.2	3.8	3.1	3.7	3.8	2.6	2.7	2.8	3.1	4.0	0.0	3.0	4.3	3.8	3.0
	Abiotic	sand	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA		4.3	4.0	2.0	3.7	3.8	3.6
	some in 'loose parts'	soil / dirt ie also in worn turf	3.2	1.7	2.3	3.9	3.6	2.9	3.2	1.5	3.0	2.8	3.0	2.7		sand	NA	NA		
	existing	rocks-stone	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA							
	Found	nests	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA							
	Built	gardens	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA							
	some in 'fixed features'	class circles/seating							NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	
		curb edge catch basin riprap	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA		3.3	3.0	0.0	4.4	5.0	3.1
Choice, assembly of elements	*Fixed Features*																			
	some in 'built'	entrances; semi-defined							NA	NA	NA	NA	NA							
	existing	pathways-sidewalks ie conc wood	NA	NA	NA	NA	NA		2.7	3.0	2.0	3.5	3.0	2.8	4.0	2.0	2.3	4.0	5.0	3.5
		signs/displays	0.0	1.0	2.0	0.0	0.0		NA	NA	NA	NA	NA							
		landforms/topo ie swale or hill	NA	NA	NA	NA	NA		3.3	1.0	3.0	4.0	4.3	3.1						
		open area, semi-open																		
		fences/enclosures ie edge													1.0	0.0	2.0	1.0	5.0	1.8
		surfacing-groundcover ie woodchips	2.5	1.0	1.0	5.0	3.0	2.5	NA	NA	NA	NA	NA							
		benches / sitting features	3.3	2.9	3.5	3.7	5.0	3.7	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	
		art bench	2.0	1.7	2.0	2.0	5.0	2.5	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA	
		multipurpose/games ie bb backstop							1.0	2.3	1.0	0.0	2.0	1.3	NA	NA	NA	NA	NA	
		lights ie at edge							1.0	1.0	0.0	0.0	2.0	0.8						
	Loose Parts	rocks stones							NA	NA	NA	NA	NA							
		Organisms (exist, potential)																		
		mammals	2.8	2.0	2.0	3.5	2.3	2.5	1.0	1.0	0.0	0.0	2.0	0.8						
		birds	3.0	2.5	2.3	3.5	3.0	2.9	2.3	1.0	0.0	0.0	1.8	1.0	1.0	0.0	0.0	4.0	4.0	1.8
		insects													3.3	0.0	3.0	4.5	4.0	3.0
		fish-aquatic-amphibians	NA	NA	NA	NA	NA		NA	NA	NA	NA	NA		1.0	0.0	0.0	2.5	5.0	1.7
		amphibians																		
		reptiles																		
		total	23.1	16.9	20.8	29.7	29.4	23.4	22.2	16.1	13.6	16.5	24.0	18.5	30.1	14.3	18.0	36.9	44.3	28.7
			9						9						11					
130313 rev 130406		Teachers' weighted Average Rating	2.6	1.9	2.3	3.3	3.3	2.6	2.5	1.8	1.5	1.8	2.7	2.1	2.7	1.3	1.6	3.4	4.0	2.6

APPENDIX 1C. TEACHERS' SURVEY QUESTION 4, WITH MEAN WEIGHTED AVERAGE CURRICULUM AND LESSON COMPONENT AFFORDANCE WEIGHTED MEAN RATINGS BY GRADE K-2 AND 3-5 GROUPINGS.

4. How suitable are the following Outdoor Play and Learning Areas for the curriculum and activities listed? (Please rate, 1 = low, 5 = high)							cal weighted averages grades		
Literary Park									
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**	**K 1 2**	**3 4 5**	**All**
Teaching Science	10	3	5	1	0	19	**1.9**	**1.4**	**1.8**
Teaching Health	13	4	2	0	0	19	**1.4**	**1.5**	**1.4**
Teaching Social Studies, including Geography	11	3	3	2	0	19	**1.6**	**1.6**	**1.8**
Student Inquiry, based on Gardner's Multiple Intelligences	6	5	2	2	4	19	**2.3**	**2.4**	**2.6**
Teaching that Uses Students' Senses	2	6	5	2	4	19	**2.8**	**2.6**	**3.0**
East Lawn									
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**			
Teaching Science	10	1	6	2	0	19	**2.1**	**1.8**	**2.0**
Teaching Health	5	2	10	2	0	19	**2.4**	**3.1**	**2.5**
Teaching Social Studies, including Geography	10	3	5	1	0	19	**1.6**	**2.0**	**1.8**
Student Inquiry, based on Gardner's Multiple Intelligences	5	8	3	1	2	19	**2.0**	**2.5**	**2.3**
Teaching that Uses Students' Senses	6	6	3	2	2	19	**2.2**	**2.3**	**2.4**
Raingarden									
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**			
Teaching Science	0	2	5	5	7	19	**4.1**	**3.6**	**3.9**
Teaching Health	11	7	1	0	0	19	**1.5**	**1.5**	**1.5**
Teaching Social Studies, including Geography	10	2	7	0	0	19	**1.7**	**1.5**	**1.8**
Student Inquiry, based on Gardner's Multiple Intelligences	1	2	5	3	8	19	**4.1**	**3.0**	**3.8**
Teaching that Uses Students' Senses	0	0	4	7	8	19	**4.3**	**3.9**	**4.2**
						Question Totals			
					answered question	**19**	10	8	19
					skipped question	**2**	1	1	2

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APPENDIX 1D. TEACHERS' SURVEY QUESTIONS: EXCEL SPREADSHEET SUMMARIES; DOWNLOADED FROM SURVEYMONKEY INC WEBSITE, 2012/2013.

1. What grades, and program, do you currently teach at Highlands?			
Answer Options		**Response Percent**	**Response Count**
Kindergarten		23.8%	5
1st		28.6%	6
2nd		33.3%	7
3rd		28.6%	6
4th		28.6%	6
5th		19.0%	4
Continuous Progress		28.6%	6
Discovery Program		33.3%	7
Other (please specify)		4.8%	1
answered question			21
skipped question			0
Number	Response Date	Other (please specify)	Categories
1	Nov 23, 2012 4:23 PM	Specialist for all grades	

2. How long have you been teaching at Highlands?		
Answer Options	**Response Percent**	**Response Count**
1st Year	0.0%	0
1 - 2 Years	14.3%	3
3 - 5 Years	0.0%	0
Greater than 5 Years	85.7%	18
answered question		21
skipped question		0

3. Last year, how often did you use the Highlands school grounds Outdoor Play and Learning Areas for teaching and learning?			
Answer Options		**Response Percent**	**Response Count**
Daily		0.0%	0
Weekly		19.0%	4
Monthly		57.1%	12
Did Not Use		0.0%	0
Was Not Teaching At Highlands Last Year		0.0%	0
Other (please specify)		23.8%	5
answered question			21
skipped question			0
Number	Response Date	Other (please specify)	Categories
1	Nov 23, 2012 4:23 PM	Quarterly	
2	Oct 29, 2012 2:28 PM	bi weekly	
3	Oct 29, 2012 2:26 PM	I taught half day K so we did outdoor learning on a weekly or bi-weekly basis. This year, I use it at least once a week, if not two times.	
4	Oct 29, 2012 2:21 PM	Weekly - weather dependent	
5	Oct 29, 2012 2:21 PM	Weekly in warm weather seasons, monthly in winter	

4. How suitable are the following Outdoor Play and Learning Areas for the curriculum and activities listed? (Please rate, 1 = low, 5 = high)						
Literary Park						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Teaching Science	10	3	5	1	0	19
Teaching Health	13	4	2	0	0	19
Teaching Social Studies, including Geography	11	3	3	2	0	19
Student Inquiry, based on Gardner's Multiple Intelligences	6	5	2	2	4	19
Teaching that Uses Students' Senses	2	6	5	2	4	19
East Lawn						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Teaching Science	10	1	6	2	0	19
Teaching Health	5	2	10	2	0	19
Teaching Social Studies, including Geography	10	3	5	1	0	19
Student Inquiry, based on Gardner's Multiple Intelligences	5	8	3	1	2	19
Teaching that Uses Students' Senses	6	6	3	2	2	19
Raingarden						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Teaching Science	0	2	5	5	7	19
Teaching Health	11	7	1	0	0	19
Teaching Social Studies, including Geography	10	2	7	0	0	19
Student Inquiry, based on Gardner's Multiple Intelligences	1	2	5	3	8	19
Teaching that Uses Students' Senses	0	0	4	7	8	19
						Question Totals
answered question						19
skipped question						2

5. Which features of the LITERARY PARK make it suitable for teaching SCIENCE? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Trees and Shrubs	50.0%	9
Grass	27.8%	5
Soil / dirt	27.8%	5
Art Bench	11.1%	2
Wood Benches and Rock Seating	27.8%	5
Rock with Sign	5.6%	1
Woodchips	11.1%	2
Birds	38.9%	7
Animals	27.8%	5
I Don't have enough experience with Literary Park, SKIP to FINAL Literary Park Question	38.9%	7
Other (please specify)	0.0%	0
answered question		18
skipped question		3

6. How would you rate the "Top" LITERARY PARK features regarding their suitability for teaching SCIENCE? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs	10	10	91%
Grass	3	3	27%
Soil / dirt	5	5	45%
Art Bench	0	0	0%
Wood Benches and Rock Seating	6	6	55%
Rock with Sign	0	0	0%
Woodchips	2	2	18%
Birds	5	5	45%
Animals	4	4	36%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs	0	1	4	4	1	10
Wood Benches and Rock Seating	1	1	1	1	2	6
Soil / dirt	1	0	2	1	1	5
Birds	0	1	3	1	0	5
Grass	0	1	3	0	0	4
Animals	0	3	0	0	1	4
Woodchips	0	1	1	0	0	2
Art Bench	0	1	0	0	0	1
Rock with Sign	0	0	0	0	0	0
Other	0	0	0	0	0	0
						Question Totals
answered question						*11*
skipped question						*10*

7. Which features of the LITERARY PARK make it suitable for teaching HEALTH? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs		55.6%	5
Grass		22.2%	2
Soil / dirt		11.1%	1
Art Bench		0.0%	0
Wood Benches and Rock Seating		66.7%	6
Rock with Sign		0.0%	0
Woodchips		0.0%	0
Birds		0.0%	0
Animals		11.1%	1
Other (please specify)		22.2%	2
answered question			9
skipped question			12
Number	Response Date	Other (please specify)	Categories
1	Oct 29, 2012 2:32 PM	None	
2	Oct 29, 2012 2:29 PM	Open area for small groups to meet and play/plan together. Large gathering area for presentations.	

8. How would you rate the "Top" LITERARY PARK features regarding their suitability for teaching HEALTH? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs	6	6	60%
Grass	2	2	20%
Soil / dirt	1	1	10%
Art Bench	2	2	20%
Wood Benches and Rock Seating	6	6	60%
Rock with Sign	0	0	0%
Woodchips	0	0	0%
Birds	2	2	20%
Animals	1	1	10%
Other	1	1	10%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Wood Benches and Rock Seating	1	2	2	1	1	7
Trees and Shrubs	2	3	3	0	0	8
Birds	2	0	0	2	0	4
Grass	2	0	2	0	0	4
Animals	2	0	0	1	0	3
Soil / dirt	2	0	1	0	0	3
Art Bench	2	0	1	0	0	3
Other	1	0	1	0	0	2
Rock with Sign	2	0	0	0	0	2
Woodchips	2	0	0	0	0	2
						Question Totals
answered question						10
skipped question						11

9. Which features of the LITERARY PARK make it suitable for teaching SOCIAL STUDIES, including GEOGRAPHY? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs		71.4%	5
Grass		28.6%	2
Soil / dirt		42.9%	3
Art Bench		14.3%	1
Wood Benches and Rock Seating		57.1%	4
Rock with Sign		14.3%	1
Woodchips		14.3%	1
Birds		42.9%	3
Animals		14.3%	1
Other (please specify)		14.3%	1
answered question			7
skipped question			14
Number	Response Date	Other (please specify)	Categories
1	Oct 29, 2012 2:32 PM	None	

10. How would you rate the "Top" LITERARY PARK features regarding their suitability for teaching SOCIAL STUDIES, including GEOGRAPHY? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs	5	5	71%
Grass	2	2	29%
Soil / dirt	2	2	29%
Art Bench	1	1	14%
Wood Benches and Rock Seating	4	4	57%
Rock with Sign	1	1	14%
Woodchips	0	0	0%
Birds	2	2	29%
Animals	1	1	14%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs	1	1	2	1	1	6
Wood Benches and Rock Seating	1	0	1	0	2	4
Grass	1	0	1	1	0	3
Soil / dirt	1	1	0	1	0	3
Birds	1	1	0	1	0	3
Art Bench	1	0	1	0	0	2
Rock with Sign	1	0	1	0	0	2
Animals	1	0	1	0	0	2
Woodchips	1	0	0	0	0	1
Other	1	0	0	0	0	1
						Question Totals
answered question						7
skipped question						14

11. Which features of the LITERARY PARK make it suitable for STUDENT INQUIRY? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Trees and Shrubs	88.9%	8
Grass	77.8%	7
Soil / dirt	77.8%	7
Art Bench	22.2%	2
Wood Benches and Rock Seating	44.4%	4
Rock with Sign	11.1%	1
Woodchips	55.6%	5
Birds	66.7%	6
Animals	66.7%	6
Other (please specify)	0.0%	0
answered question		9
skipped question		12

12. How would you rate the "Top" LITERARY PARK features regarding their suitability for STUDENT INQUIRY? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs	8	8	89%
Grass	5	5	56%
Soil / dirt	7	7	78%
Art Bench	2	2	22%
Wood Benches and Rock Seating	3	3	33%
Rock with Sign	0	0	0%
Woodchips	1	1	11%
Birds	4	4	44%
Animals	4	4	44%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs	0	0	2	5	1	8
Soil / dirt	0	0	2	4	1	7
Grass	0	0	0	4	1	5
Birds	0	1	1	1	1	4
Animals	0	1	1	1	1	4
Wood Benches and Rock Seating	0	1	0	1	1	3
Woodchips	0	0	0	0	1	1
Art Bench	1	0	1	0	0	2
Rock with Sign	0	0	0	0	0	0
Other	0	0	0	0	0	0
						Question Totals
answered question						9
skipped question						12

13. Which features of the LITERARY PARK make it suitable for teaching that uses STUDENT'S SENSES? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Trees and Shrubs	81.8%	9
Grass	63.6%	7
Soil / dirt	72.7%	8
Art Bench	27.3%	3
Wood Benches and Rock Seating	45.5%	5
Rock with Sign	18.2%	2
Woodchips	63.6%	7
Birds	72.7%	8
Animals	45.5%	5
Other (please specify)	0.0%	0
answered question		11
skipped question		10

14. How would you rate the "Top" LITERARY PARK features regarding their suitability for teaching that uses STUDENT'S SENSES? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs	9	9	82%
Grass	5	5	45%
Soil / dirt	9	9	82%
Art Bench	1	1	9%
Wood Benches and Rock Seating	1	1	9%
Rock with Sign	0	0	0%
Woodchips	4	4	36%
Birds	6	6	55%
Animals	3	3	27%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs	0	2	1	4	2	9
Soil / dirt	0	2	2	3	2	9
Grass	1	0	0	2	2	5
Birds	0	2	2	2	0	6
Woodchips	1	0	1	2	0	4
Animals	1	1	0	1	0	3
Art Bench	0	0	0	0	1	1
Wood Benches and Rock Seating	0	0	0	0	1	1
Rock with Sign	0	0	0	0	0	0
Other	0	0	0	0	0	0
						Question Totals
answered question						11
skipped question						10

15. Do you have any comments, or is there anything else about the LITERARY PARK that makes it suitable, or not suitable, for INTEGRATED THEMATIC INSTRUCTION? (please specify)			
Answer Options		**Response Count**	
		6	
answered question		6	
skipped question		15	
Number	Response Date	Response Text	Categories
1	Nov 23, 2012 4:30 PM	Curious to learn ways to better integrate it into my teaching.	
2	Oct 29, 2012 2:35 PM	I guess I just don't use that space very often. The husky woods is right outside my window.	
		I'm sure there are many ways to use this area. It has a gathering place and natural things to observe ie plants or insects.	
3	Oct 29, 2012 2:29 PM	Love the benches. For Kindergarten, have sat on benches, observed using 5 senses, other science units. Do not use for health, social studies.	
4	Oct 29, 2012 2:26 PM	Trees support science investigations and Authors support literary connections and author studies.	
5	Oct 29, 2012 2:25 PM	haven't used it enough	
6	Oct 29, 2012 2:25 PM	ITI is based on the idea that students "construct" their own understandings based upon a "being there experience". When we teach watercycles, or cause and effect, or interdependence the pond below the hill or the rain garden work but I would like to learn how the Literary park is connected with student curriculum.	
121217	rev 130119		

1. Which features of the EAST LAWN make it suitable for teaching SCIENCE? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs at Far Edge of Lawn		50.0%	7
Open Grass Area		35.7%	5
Soil / dirt		35.7%	5
Hill and Swale along Far Edge		21.4%	3
Baseball Backstop and Infield		0.0%	0
Sidewalk along Edge		0.0%	0
Lights		7.1%	1
Birds		7.1%	1
Animals		14.3%	2
I Don't have enough experience with East Lawn, SKIP to FINAL East Lawn Question		35.7%	5
Other (please specify)		7.1%	1
answered question			14
skipped question			0
Number	Response Date	Other (please specify)	Categories
1	Nov 12, 2012 9:36 AM	Don't see this area being amenable to teaching science especially compared to other areas on campus.	

2. How would you rate the "Top" EAST LAWN features regarding their suitability for teaching SCIENCE? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs at Far Edge of Lawn	5	5	56%
Open Grass Area	4	4	44%
Soil / dirt	3	3	33%
Hill and Swale along Far Edge	2	2	22%
Baseball Backstop and Infield	0	0	0%
Sidewalk along Edge	1	1	11%
Lights	0	0	0%
Birds	3	3	33%
Animals	1	1	11%
Other	2	2	22%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs at Far Edge of Lawn	0	0	1	4	1	6
Open Grass Area	0	0	2	4	0	6
Soil / dirt	0	1	2	2	0	5
Hill and Swale along Far Edge	0	1	2	0	1	4
Birds	1	1	2	0	0	4
Sidewalk along Edge	0	1	2	0	0	3
Other	2	0	0	0	0	2
Baseball Backstop and Infield	1	0	0	0	0	1
Lights	1	0	0	0	0	1
Animals	1	0	0	0	0	1
						Question Totals
answered question						9
skipped question						5

3. Which features of the EAST LAWN make it suitable for teaching HEALTH? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs at Far Edge of Lawn		0.0%	0
Open Grass Area		66.7%	4
Soil / dirt		0.0%	0
Hill and Swale along Far Edge		0.0%	0
Baseball Backstop and Infield		16.7%	1
Sidewalk along Edge		33.3%	2
Lights		0.0%	0
Birds		0.0%	0
Animals		0.0%	0
Other (please specify)		33.3%	2
answered question			6
skipped question			8
Number	Response Date	Other (please specify)	Categories
1	Nov 12, 2012 9:36 AM	I cannot find a compelling reason to teach health in this area.	
2	Oct 31, 2012 7:01 PM	not suitable	

4. How would you rate the "Top" EAST LAWN features regarding their suitability for teaching HEALTH? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs at Far Edge of Lawn	1	1	17%
Open Grass Area	3	3	50%
Soil / dirt	1	1	17%
Hill and Swale along Far Edge	0	0	0%
Baseball Backstop and Infield	2	2	33%
Sidewalk along Edge	3	3	50%
Lights	0	0	0%
Birds	0	0	0%
Animals	0	0	0%
Other	1	1	17%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Open Grass Area	1	0	0	2	2	5
Sidewalk along Edge	1	0	1	2	0	4
Baseball Backstop and Infield	1	0	2	0	0	3
Trees and Shrubs at Far Edge of Lawn	1	1	0	0	0	2
Soil / dirt	1	1	0	0	0	2
Other	2	0	0	0	0	2
Hill and Swale along Far Edge	1	0	0	0	0	1
Lights	1	0	0	0	0	1
Birds	1	0	0	0	0	1
Animals	1	0	0	0	0	1
						Question Totals
answered question						6
skipped question						8

5. Which features of the EAST LAWN make it suitable for teaching SOCIAL STUDIES, including GEOGRAPHY? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs at Far Edge of Lawn		28.6%	2
Open Grass Area		57.1%	4
Soil / dirt		0.0%	0
Hill and Swale along Far Edge		28.6%	2
Baseball Backstop and Infield		14.3%	1
Sidewalk along Edge		14.3%	1
Lights		0.0%	0
Birds		0.0%	0
Animals		0.0%	0
Other (please specify)		28.6%	2
answered question			7
skipped question			7
Number	Response Date	Other (please specify)	Categories
1	Nov 12, 2012 9:37 AM	Not suitable.	
2	Oct 31, 2012 7:03 PM	not suitable	

6. How would you rate the "Top" EAST LAWN features regarding their suitability for teaching SOCIAL STUDIES, including GEOGRAPHY? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs at Far Edge of Lawn	3	3	50%
Open Grass Area	4	4	67%
Soil / dirt	1	1	17%
Hill and Swale along Far Edge	1	1	17%
Baseball Backstop and Infield	1	1	17%
Sidewalk along Edge	1	1	17%
Lights	0	0	0%
Birds	0	0	0%
Animals	0	0	0%
Other	1	1	17%

Rate the top features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Open Grass Area	1	2	1	0	1	5
Trees and Shrubs at Far Edge of Lawn	1	1	1	0	0	3
Soil / dirt	0	0	1	0	0	1
Hill and Swale along Far Edge	0	0	1	0	0	1
Sidewalk along Edge	0	1	0	0	0	1
Baseball Backstop and Infield	1	0	0	0	0	1
Other	1	0	0	0	0	1
Lights	0	0	0	0	0	0
Birds	0	0	0	0	0	0
Animals	0	0	0	0	0	0
						Question Totals
answered question						6
skipped question						8

7. Which features of the EAST LAWN make it suitable for STUDENT INQUIRY? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs at Far Edge of Lawn		88.9%	8
Open Grass Area		66.7%	6
Soil / dirt		66.7%	6
Hill and Swale along Far Edge		44.4%	4
Baseball Backstop and Infield		0.0%	0
Sidewalk along Edge		33.3%	3
Lights		0.0%	0
Birds		22.2%	2
Animals		11.1%	1
Other (please specify)		11.1%	1
answered question			9
skipped question			5
Number	Response Date	Other (please specify)	Categories
1	Nov 12, 2012 9:37 AM	Don't see it happening.	

8. How would you rate the "Top" EAST LAWN features regarding their suitability for STUDENT INQUIRY? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs at Far Edge of Lawn	6	6	67%
Open Grass Area	4	4	44%
Soil / dirt	5	5	56%
Hill and Swale along Far Edge	0	0	0%
Baseball Backstop and Infield	0	0	0%
Sidewalk along Edge	1	1	11%
Lights	0	0	0%
Birds	0	0	0%
Animals	0	0	0%
Other	1	1	11%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs at Far Edge of Lawn	1	1	1	3	2	8
Soil / dirt	0	2	3	1	0	6
Open Grass Area	1	1	3	1	0	6
Sidewalk along Edge	0	0	1	1	0	2
Hill and Swale along Far Edge	0	0	0	1	0	1
Other	1	0	0	0	0	1
Baseball Backstop and Infield	0	0	0	0	0	0
Lights	0	0	0	0	0	0
Birds	0	0	0	0	0	0
Animals	0	0	0	0	0	0
						Question Totals
answered question						9
skipped question						5

9. Which features of the EAST LAWN make it suitable for teaching that uses STUDENT'S SENSES? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Trees and Shrubs at Far Edge of Lawn		87.5%	7
Open Grass Area		75.0%	6
Soil / dirt		50.0%	4
Hill and Swale along Far Edge		37.5%	3
Baseball Backstop and Infield		12.5%	1
Sidewalk along Edge		37.5%	3
Lights		12.5%	1
Birds		75.0%	6
Animals		50.0%	4
Other (please specify)		12.5%	1
answered question			8
skipped question			6
Number	Response Date	Other (please specify)	Categories
1	Nov 12, 2012 9:38 AM	Not applicable.	

10. How would you rate the "Top" EAST LAWN features regarding their suitability for teaching that uses STUDENT SENSES? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Trees and Shrubs at Far Edge of Lawn	5	5	63%
Open Grass Area	4	4	50%
Soil / dirt	2	2	25%
Hill and Swale along Far Edge	1	1	13%
Baseball Backstop and Infield	0	0	0%
Sidewalk along Edge	2	2	25%
Lights	0	0	0%
Birds	2	2	25%
Animals	1	1	13%
Other	1	1	13%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Trees and Shrubs at Far Edge of Lawn	0	1	4	2	0	7
Open Grass Area	0	2	3	1	0	6
Hill and Swale along Far Edge	0	0	1	0	2	3
Soil / dirt	0	0	4	0	0	4
Sidewalk along Edge	0	0	4	0	0	4
Birds	2	1	1	0	0	4
Animals	1	1	1	0	0	3
Baseball Backstop and Infield	1	0	1	0	0	2
Lights	1	0	1	0	0	2
Other	2	0	0	0	0	2
						Question Totals
answered question						8
skipped question						6

11. Do you have any comments, or is there anything else about the EAST LAWN that makes it suitable, or not suitable, for INTEGRATED THEMATIC INSTRUCTION? (please specify)			
Answer Options		**Response Count**	
		6	
answered question		6	
skipped question		8	
Number	Response Date	Response Text	Categories
1	Nov 19, 2012 2:25 PM	Would be great to have diggable soil accessible to get soil samples for Pebbles, Sand, & Silt FOSS kit.	
2	Nov 12, 2012 9:39 AM	This area is the least suitable on our campus for teaching ITI. There are so many other areas that would be desirable.	
3	Nov 6, 2012 9:10 PM	Haven't really used this space much outside of flying kites for a wind and weather science experiment (although the west lawn is easier for this as well). The area is so large and flat that it can make the perimeter area a challenge for young students.	
4	Nov 6, 2012 3:34 AM	Isn't as useful as the Husky Woods - I mostly use it for team building games and large motor	
5	Oct 31, 2012 7:04 PM	I'd love to see a water source, or habitat that would allow for a better investigation of insects. We have a woodland, and the pond below the hill, perhaps a prairie	
6	Oct 31, 2012 1:21 AM	It is a great space for large motor type lessons with a large group.	

12. Which features of the RAINGARDEN make it suitable for teaching SCIENCE? (select all that apply)			
Answer Options		**Response Percent**	**Response Count**
Water		90.0%	9
Trees and Shrubs		90.0%	9
Perennials / wildflowers		80.0%	8
Grass		80.0%	8
Sand / soil / dirt		70.0%	7
Drain Inlet at Curb, and Stones		30.0%	3
Wood Walkways		30.0%	3
Wood Fence		0.0%	0
Birds		60.0%	6
Insects		70.0%	7
Amphibians		60.0%	6
I Don't have enough experience with Raingarden, SKIP to FINAL Raingarden Question		10.0%	1
Other (please specify)		10.0%	1
answered question			10
skipped question			4
Number	Response Date	Other (please specify)	Categories
1	Nov 23, 2012 4:37 PM	I have seen mice too	

13. How would you rate the "Top" RAINGARDEN features regarding their suitability for teaching SCIENCE? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Water	8	8	80%
Trees and Shrubs	6	6	60%
Perennials / wildflowers	8	8	80%
Grass	2	2	20%
Sand / soil / dirt	2	2	20%
Drain Inlet at Curb, and Stones	2	2	20%
Wood Walkways	1	1	10%
Wood Fence	0	0	0%
Birds	1	1	10%
Insects	5	5	50%
Amphibians	0	0	0%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Perennials / wildflowers	0	1	0	4	4	9
Water	0	0	2	5	2	9
Trees and Shrubs	0	0	1	5	1	7
Insects	0	1	2	3	0	6
Sand / soil / dirt	0	0	0	2	1	3
Grass	0	0	0	3	0	3
Drain Inlet at Curb, and Stones	0	1	0	2	0	3
Wood Walkways	0	0	0	2	0	2
Birds	2	0	0	0	0	2
Wood Fence	1	0	0	0	0	1
Amphibians	1	0	0	0	0	1
Other	0	0	0	0	0	0
						Question Totals
answered question						10
skipped question						4

14. Which features of the RAINGARDEN make it suitable for teaching HEALTH? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Water	83.3%	5
Trees and Shrubs	33.3%	2
Perennials / wildflowers	16.7%	1
Grass	0.0%	0
Sand / soil / dirt	16.7%	1
Drain Inlet at Curb, and Stones	16.7%	1
Wood Walkways	16.7%	1
Wood Fence	0.0%	0
Birds	0.0%	0
Insects	0.0%	0
Amphibians	0.0%	0
Other (please specify)	0.0%	0
answered question		6
skipped question		8

15. How would you rate the "Top" RAINGARDEN features regarding their suitability for teaching HEALTH? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Water	6	6	100%
Trees and Shrubs	3	3	50%
Perennials / wildflowers	2	2	33%
Grass	0	0	0%
Sand / soil / dirt	1	1	17%
Drain Inlet at Curb, and Stones	1	1	17%
Wood Walkways	1	1	17%
Wood Fence	0	0	0%
Birds	0	0	0%
Insects	0	0	0%
Amphibians	0	0	0%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Water	1	1	2	2	0	6
Trees and Shrubs	0	2	1	0	0	3
Perennials / wildflowers	1	0	0	0	1	2
Sand / soil / dirt	0	0	0	1	0	1
Drain Inlet at Curb, and Stones	0	0	1	0	0	1
Wood Walkways	0	1	0	0	0	1
Grass	0	0	0	0	0	0
Wood Fence	0	0	0	0	0	0
Birds	0	0	0	0	0	0
Insects	0	0	0	0	0	0
Amphibians	0	0	0	0	0	0
Other	0	0	0	0	0	0
						Question Totals
answered question						6
skipped question						8

16. Which features of the RAINGARDEN make it suitable for teaching SOCIAL STUDIES, including GEOGRAPHY? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Water	66.7%	4
Trees and Shrubs	33.3%	2
Perennials / wildflowers	33.3%	2
Grass	50.0%	3
Sand / soil / dirt	33.3%	2
Drain Inlet at Curb, and Stones	16.7%	1
Wood Walkways	66.7%	4
Wood Fence	33.3%	2
Birds	0.0%	0
Insects	16.7%	1
Amphibians	16.7%	1
Other (please specify)	0.0%	0
answered question		6
skipped question		8

17. How would you rate the "Top" RAINGARDEN features regarding their suitability for teaching SOCIAL STUDIES, including GEOGRAPHY? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Water	4	4	67%
Trees and Shrubs	1	1	17%
Perennials / wildflowers	3	3	50%
Grass	2	2	33%
Sand / soil / dirt	1	1	17%
Drain Inlet at Curb, and Stones	0	0	0%
Wood Walkways	3	3	50%
Wood Fence	1	1	17%
Birds	0	0	0%
Insects	1	1	17%
Amphibians	0	0	0%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Water	0	1	1	1	1	4
Perennials / wildflowers	0	0	2	0	1	3
Wood Walkways	0	2	1	0	0	3
Grass	0	1	0	1	0	2
Insects	0	0	1	0	0	1
Trees and Shrubs	0	1	0	0	0	1
Sand / soil / dirt	0	1	0	0	0	1
Wood Fence	0	1	0	0	0	1
Drain Inlet at Curb, and Stones	0	0	0	0	0	0
Birds	0	0	0	0	0	0
Amphibians	0	0	0	0	0	0
Other	0	0	0	0	0	0
						Question Totals
answered question						6
skipped question						8

18. Which features of the RAINGARDEN make it suitable for STUDENT INQUIRY? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Water	100.0%	10
Trees and Shrubs	80.0%	8
Perennials / wildflowers	100.0%	10
Grass	80.0%	8
Sand / soil / dirt	80.0%	8
Drain Inlet at Curb, and Stones	60.0%	6
Wood Walkways	50.0%	5
Wood Fence	20.0%	2
Birds	60.0%	6
Insects	80.0%	8
Amphibians	60.0%	6
Other (please specify)	0.0%	0
answered question		10
skipped question		4

19. How would you rate the "Top" RAINGARDEN features regarding their suitability for STUDENT INQUIRY? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Water	8	8	80%
Trees and Shrubs	3	3	30%
Perennials / wildflowers	7	7	70%
Grass	2	2	20%
Sand / soil / dirt	3	3	30%
Drain Inlet at Curb, and Stones	3	3	30%
Wood Walkways	1	1	10%
Wood Fence	0	0	0%
Birds	0	0	0%
Insects	5	5	50%
Amphibians	1	1	10%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Water	0	0	1	5	3	9
Perennials / wildflowers	0	1	2	1	4	8
Insects	0	0	0	3	3	6
Drain Inlet at Curb, and Stones	0	0	1	1	3	5
Trees and Shrubs	0	0	0	2	2	4
Grass	0	0	1	0	2	3
Sand / soil / dirt	0	0	2	0	1	3
Wood Walkways	0	0	0	2	0	2
Amphibians	1	0	0	1	0	2
Birds	0	0	0	1	0	1
Wood Fence	1	0	0	0	0	1
Other	0	0	0	0	0	0
						Question Totals
answered question						10
skipped question						4

20. Which features of the RAINGARDEN make it suitable for teaching that uses STUDENT'S SENSES? (select all that apply)		
Answer Options	**Response Percent**	**Response Count**
Water	100.0%	10
Trees and Shrubs	70.0%	7
Perennials / wildflowers	90.0%	9
Grass	90.0%	9
Sand / soil / dirt	80.0%	8
Drain Inlet at Curb, and Stones	40.0%	4
Wood Walkways	60.0%	6
Wood Fence	30.0%	3
Birds	70.0%	7
Insects	60.0%	6
Amphibians	50.0%	5
Other (please specify)	0.0%	0
answered question		10
skipped question		4

21. How would you rate the "Top" RAINGARDEN features regarding their suitability for teaching that uses STUDENT'S SENSES? (select 4 features maximum, then rate them)			
Select the "top" features, 4 maximum			
Answer Options	**X**	**Response Count**	**Response Percent**
Water	6	6	60%
Trees and Shrubs	3	3	30%
Perennials / wildflowers	7	7	70%
Grass	3	3	30%
Sand / soil / dirt	5	5	50%
Drain Inlet at Curb, and Stones	0	0	0%
Wood Walkways	2	2	20%
Wood Fence	0	0	0%
Birds	1	1	10%
Insects	1	1	10%
Amphibians	0	0	0%
Other	0	0	0%

Rate the "top" features (1 = low, 5 = high)						
Answer Options	**1**	**2**	**3**	**4**	**5**	**Response Count**
Perennials / wildflowers	0	0	1	3	5	9
Water	0	2	1	2	2	7
Sand / soil / dirt	0	1	0	4	1	6
Trees and Shrubs	0	0	1	1	2	4
Grass	0	1	1	0	2	4
Wood Walkways	0	0	0	0	3	3
Birds	0	0	1	0	1	2
Insects	0	0	1	0	1	2
Drain Inlet at Curb, and Stones	0	0	0	0	1	1
Wood Fence	0	0	0	0	1	1
Amphibians	0	0	0	0	1	1
Other	0	0	0	0	0	0
						Question Totals
answered question						10
skipped question						4

22. Do you have any comments, or is there anything else about the RAINGARDEN that make it suitable, or not suitable, for INTEGRATED THEMATIC INSTRUCTION? (please specify)	
Answer Options	**Response Count**
	0
answered question	0
skipped question	14
121218 rev 130119	

APPENDIX 1E. SELECT FINDINGS TABLES AND FIGURES

Teachers' Perceptions of Integrated Thematic Instruction Affordances of Highlands Schoolgrounds

Dec 9 2012

% respondents answering

Curriculum etc	LITERARY PARK %	EAST LAWN %	RAINGARDEN %	Ave % all respondents answering Qs % all ave	rel response all ave
Science	69	82	71	74	highest
Health	45	43	43	43	low
Social Studies	33	46	41	41	lowest
Inquiry	43	64	71	59	med
Senses	52	57	71	60	med

Setting

% of respondents that skipped setting Questions due to lack of experience with setting

LITERARY PARK	EAST LAWN	RAINGARDEN
33	36	7
7 out of 21	5 out of 14	1 out of 14

Figure 41E-1. Percent of Teachers Responding to Teachers' Survey 1 Questions 5 – 15 Regarding Highlands School Grounds Individual Settings.

Findings Tables: Teachers' Perceptions at EACH Setting

Literary Park: Summary of Findings; Teachers' Perceptions at Each Setting

Table 4-LP4. Statistically Significant Homogenous Subsets of ITI Curriculum and Lesson Activity Components at Literary Park Setting

Science	**Health**	**Social Studies**	**Student Inquiry**	**Sensory**	
Health	**Science**	**Science**	**Science**	**Science**	
Social Studies	**Social Studies**	**Health**	**Sensory**	**Social Studies**	
Inquiry		**Sensory**		**Student Inquiry**	
Sensory					

NOTE: Based on ANOVA analysis, 4/12/13.

Table 4-LP5. Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at Literary Park

Cluster One	Cluster Two	*Comments*
Science	**Student Inquiry**	*SCIENCE and SOCIAL STUDIES tend to agree with all other curriculum and lesson activities.*
Health	**Student Senses / Sensory Richness**	
Social Studies		

NOTE: Based on ANOVA analysis, 4/12/13.

Table 4-LP6. Teacher Ratings for Overall Suitability of Literary Park in Teaching Each ITI Curriculum and Lesson Activity Component

LITERARY PARK	TEACHERS	
	Mean Rating	Ranking
Teaching Science	1.8	LOW
Teaching Health	1.4	LOW
Teaching Social Studies, including Geography	1.8	LOW
Student Inquiry, from Gardner's Multiple Intelligences	2.6	MEDIUM
Teaching that Uses Students' Senses / Sensory Rich	3	MEDIUM
Low = 1.0 - 1.9, Medium = 2.0 - 3.6, High = 3.7 - 5.0		
Note: From Teachers' Survey 1 Question 4	121217 rev 130508	

East Lawn: Summary of Findings; Teachers' Perceptions at Each Setting

Table 4-EL4. Statistically Significant Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at the East Lawn Setting

Categories of Statistically Homogenous Subsets at East Lawn, based on Statistical Analysis				
None				
NOTE: Based on ANOVA analysis, 4/12/13.				

Table 4-EL5. Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at East Lawn

Cluster One	Cluster Two	Cluster Three
Sensory	Science	Health
		Social Studies
		Student Inquiry
NOTE: Based on ANOVA analysis, 4/12/13.		

Table 4-EL6. Teacher Ratings for Overall Suitability of East Lawn in Teaching Each ITI Curriculum and Lesson Activity Component

EAST LAWN	TEACHERS	
	Mean Rating	Ranking
Teaching Science	2	MEDIUM
Teaching Health	2.5	MEDIUM
Teaching Social Studies, including Geography	1.8	LOW
Student Inquiry, from Gardner's Multiple Intelligences	2.3	MEDIUM
Teaching that Uses Students' Senses / Sensory Rich	2.4	MEDIUM
Low = 1.0 - 1.9, Medium = 2.0 - 3.6, High = 3.7 - 5.0		
Note: From Teachers' Survey 1 Question 4	121217 rev 130508	

Table 4-RG4. Statistically Significant Homogeneous Subsets of ITI Curriculum and Lesson Activity Components at the Raingarden Setting

Categories of Statistically Homogenous Subsets at Raingarden, based on Statistical Analysis				
Science	**Health**	**Social Studies**	**Student Inquiry**	**Sensory**
Social Studies	**Social Studies**	**Health**	**Sensory**	**Student Inquiry**
		Science		
NOTE: Based on ANOVA analysis, 4/12/13.				

Table 4-RG5. Clusters of Conceptually Related Homogeneous Subsets of ITI Curriculum and Lesson Activity Components

Clusters of Homogenous Subsets at Raingarden (Visual Inspection)	
Science	**Student Inquiry**
Health	**Sensory**
Social Studies	
NOTE: Based on ANOVA analysis, 4/12/13.	

Table 4-RG6. Teacher Ratings for Overall Suitability of Raingarden in Teaching Each ITI Curriculum and Lesson Activity Component

RAINGARDEN	**TEACHERS**	
	Mean Rating	Ranking
Teaching Science	**3.9**	**HIGH**
Teaching Health	**1.5**	LOW
Teaching Social Studies, including Geography	**1.8**	LOW
Student Inquiry, from Gardner's Multiple Intelligences	**3.8**	**HIGH**
Teaching that Uses Students' Senses / Sensory Rich	**4.2**	**HIGH**
Low = 1.0 - 1.9, Medium = 2.0 - 3.6, High = 3.7 - 5.0		
Note: From Teachers' Survey 1 Question 4	121217 rev 130508	

Findings Tables: Expert judgment's Perceptions at EACH Setting

Literary Park: Summary of Findings; Expert Judgment's Perceptions at Each Setting

Table 4-LP-EJ3. Literary Park: Expert Judgment Visual Inspection; Clusters of Homogeneous Subsets of Curriculum and Lesson Activity Components

Cluster One	Cluster Two	Comments
Inquiry	**Health**	Science tends towards similarities with Social Studies
Sensory	**Social Studies**	
Science		
NOTE: Based on Visual Inspection of Tables 4-EJ1 and 4-EJ2 Grouping of Setting Elements by Magnitude of Curriculum and Lesson Activity Affordances		

Table 4-LP-EJ4. Expert Judgment; Ratings of Overall Suitability of Literary Park for Teaching Each ITI Curriculum and Lesson Activity Component

LITERARY PARK	EXPERT JUDGMENT	
	mean rating	ranking
Teaching Science	**2.0**	**MEDIUM**
Teaching Health	**1.9**	LOW
Teaching Social Studies, including Geography	**2.0**	**MEDIUM**
Student Inquiry, from Gardner's Multiple Intelligences	**2.2**	**MEDIUM**
Teaching that Uses Students' Senses	**1.5**	LOW

Based on weighted averages rating scores of the following:
Expert Judgments rating of all setting elements 121217 rev 130526

East Lawn: Summary of Findings; Expert Judgment's Perceptions at Each Setting

Table 4-EL-EJ3 East Lawn: Expert Judgment Visual Inspection; Clusters of Homogeneous Subsets of Curriculum and Lesson Activity Components

Cluster One	Cluster Two	Cluster Three
Inquiry	**Health**	**Sensory**
Social Studies	**Science**	
NOTE: Based on Visual Inspection of Table 4-EJ1 and Table 4-EJ2 Grouping of Setting Elements by Magnitude of Curriculum and Lesson Activity Affordances		

Table 4-EL-EJ4 Overall Expert Judgment Perceptions; All Setting Elements

EAST LAWN	EXPERT JUDGMENT	
	mean rating	ranking
Teaching Science	**1.5**	LOW
Teaching Health	**1.9**	LOW
Teaching Social Studies, including Geography	**1.7**	LOW
Student Inquiry, from Gardner's Multiple Intelligences	**1.7**	LOW
Teaching that Uses Students' Senses	**1**	LOW

Based on weighted averages rating scores of the following:
Expert Judgments rating of all setting elements 121217 rev 130526

Raingarden: Summary of Findings; Expert Judgment's Perceptions at Each Setting

Table 4-RG-EJ3 Raingarden: Expert Judgment Visual Inspection; Clusters of Homogeneous Subsets of Curriculum and Lesson Activity Components

Cluster One	Cluster Two	Cluster Three
Science Inquiry	**Health**	**Sensory**
	Social Studies	
NOTE: Based on Visual Inspection of Table 4-EJ1 and Table 4-EJ2 Grouping of Setting Elements by Magnitude of Curriculum and Lesson Activity Affordances		

Table 4-RG-EJ4 Overall Expert Judgment Perceptions; All Setting Elements

RAINGARDEN	EXPERT JUDGMENT	
	mean rating	ranking
Teaching Science	**2.5**	**MEDIUM**
Teaching Health	**1.8**	LOW
Teaching Social Studies, including Geography	**1.7**	LOW
Student Inquiry, from Gardner's Multiple Intelligences	**2.3**	**MEDIUM**
Teaching that Uses Students' Senses	**2.1**	**MEDIUM**

Based on weighted averages rating scores of the following:
Expert Judgments rating of all setting elements 121217 rev 130526

May 9, 2013 rev 10/24/13 rev 2/28/14 rev 5/9/14 rev 7/8/14 rev 10/6/14 rev 11/12/14